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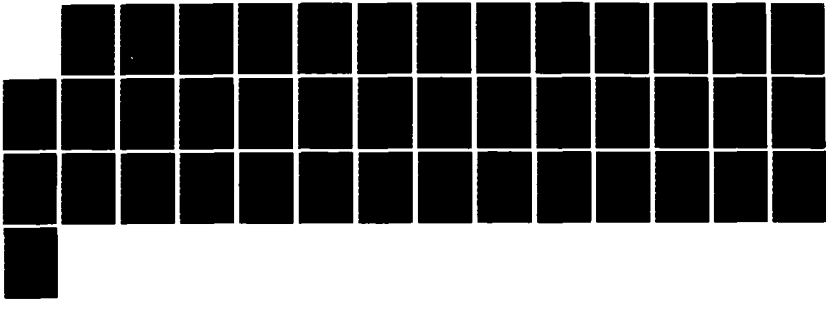

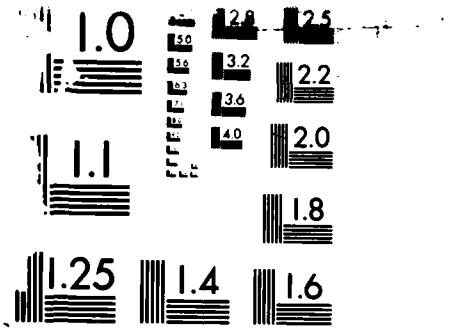

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TIDAL AND LUNAR DATA FOR POINT MUGU, SAN NICOLAS ISLAND, AND THE BARKING SANDS AREA DURING 1987

Compiled by
RICH DIXON
Geophysics Division

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DEC 1 3 1986
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31 December 1986

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PACIFIC MISSILE TEST CENTER

Point Mugu, California 93042

PACIFIC MISSILE TEST CENTER

AN ACTIVITY OF THE NAVAL AIR SYSTEMS COMMAND

Mr. T. E. Battalino, Acting Head, Geophysical Sciences Branch; Mr. R. W. Dixon, Task Engineer; Mr. D. A. Lea, Program Manager; CDR F. M. Reynolds, Geophysics Officer/Program Manager; Mr. P. D. Wilson, Assistant Range Operations Officer; and Mr. C. L. Buchheit, Director, Range Directorate, have approved this report for publication.

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Basic lunar and tidal data for Point Mugu, San Nicolas Island, and the Barking Sands Area during 1987 are provided. The data presented are (1) tidal data, (2) times of moonrise and moonset, (3) times of lunar phases, and (4) times of sunrise and sunset.

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INTRODUCTION

This publication combines into a single source all tidal and lunar data for operational locations of the Pacific Missile Test Center for use in Calendar Year 1987.

The data presentations are in two main divisions: one for Point Mugu and San Nicolas Island, and the other for the Barking Sands area. Within each division, the times of moonrise and moonset and tidal data are given. An appendix provides information regarding lunar phases. Since all such data change from year to year, this publication will be reissued annually.

Sunrise-sunset times for these locations, and associated solar data which do not change significantly from year to year, are issued as a single, permanent publication. Further information regarding any of these data may be obtained from the Geophysics Division of the Range Operations Department.

DATA SOURCE AND TIME REFERENCES

The data given here have been prepared from information contained in Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1987.*

For Point Mugu and San Nicolas Island, all times listed are Pacific Standard Time (PST); add eight hours to obtain Greenwich Mean Time (GMT or Z).**

For the Barking Sands Area, all times listed are Alaska-Hawaii Standard Time (AHST); add ten hours to obtain GMT. Daylight Saving Time is not observed in Hawaii.

*National Ocean Survey, Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1987. Washington, D.C., GPO, 1986.

**When Daylight Savings Time (PDT) is in effect, 1 hour is to be added to the times given. In 1987, Pacific Daylight Time is scheduled to commence at 0200 PST on Sunday, 5 April (add 1 hour), and to end at 0200 PDT on Sunday, 27 October (subtract 1 hour).

TIDAL DATA

The ranges of tidal heights that may be expected at Point Mugu and San Nicolas Island are shown in table 1. The range of heights for the primary harbor in the Barking Sands area, Port Allen, is shown in table 2. The times and height of high and low tides for 1987 at Point Mugu are given in the even-numbered tables 4 through 26, and at San Nicolas Island in the odd-numbered tables 5 through 27. Similar tide data for Port Allen are given in tables 29 through 40.

Table 1. Tidal Ranges for Point Mugu and San Nicolas Island.

Tidal Levels	Point Mugu	San Nicolas Island
	Height (Feet)	Height (Feet)
Extreme high water	7.3	6.7
Mean higher high water	5.3	4.9
Mean high water	4.5	4.1
Mean tide level*	2.7	2.5
Mean low water	0.9	0.8
Mean lower low water	0.0	0.0
Extreme low water	-2.0	-1.8

*The mean tide level is also called mean sea level.

Table 2. Tidal Ranges for Port Allen.

Tidal Levels	Height (Feet)
Extreme high water	2.6
Mean higher high water	1.6
Mean high water	1.2
Mean tide level*	0.7
Mean low water	0.2
Mean lower low water	0.0
Extreme low water	-0.4

*The mean tide level is also called mean sea level.

These tables list the times and heights of high and low tide for each month of the year and chronologically through each day. The heights are all measured from mean lower low water (see tables 1 and 2) and are values for a sea unaffected by wind waves or swell. The height and character of the sea surface are influenced by factors other than the predictable positions of the moon and sun, and is thus likely to be higher or lower than computed values may indicate. Information regarding the height of the tide at any time will be found in appendix A.

LUNAR DATA

Times of moonrise and moonset for the Point Mugu-San Nicolas Island area in 1987 are given in table 3, and for the Barking Sands area in table 28, preceding the tidal data for the respective stations. Information regarding the phases of the moon in 1987 will be found in appendix B.

Table 3. Moonrise and Moonset, Point Mugu, California, 1987.
Pacific Standard Time

Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	0851	1858	0904	2115	0729	1959	0723	2156	0719	2241	0852	2324	0940	2247	1128	2232	1348	2319	1436		1456	0156	1422	0304
2	0934	2013	0931	2219	0756	2103	0758	2258	0809	2331	0951	2353	1037	2311	1233	2304	1454		1518	0034	1523	0303	1453	0409
3	1009	2123	0958	2321	0824	2207	0839	2357	0904		1050		1135	2336	1341	2344	1552	0023	1554	0148	1551	0409	1528	0515
4	1039	2229	1026		0853	2310	0926		1003	0015	1148	0020	1235		1452		1641	0136	1626	0300	1621	0515	1609	0620
5	1106	2331	1056	0022	0926		1019	0051	1102	0052	1247	0045	1339	0002	1602	0033	1722	0252	1655	0410	1654	0622	1656	0722
6	1132		1129	0123	1004	0012	1115	0138	1202	0124	1347	0110	1447	0033	1708	0133	1757	0408	1723	0518	1732	0729	1749	0819
7	1158	0032	1208	0223	1047	0111	1215	0219	1301	0153	1450	0136	1559	0109	1804	0243	1828	0521	1752	0626	1815	0834	1847	0910
8	1225	0132	1253	0321	1135	0208	1315	0254	1401	0219	1558	0204	1713	0153	1851	0401	1857	0632	1823	0733	1905	0935	1946	0953
9	1256	0232	1344	0415	1230	0258	1415	0325	1501	0245	1710	0238	1824	0249	1929	0519	1925	0740	1858	0841	2000	1030	2045	1030
10	1331	0332	1440	0504	1329	0343	1516	0353	1604	0310	1825	0318	1926	0356	2002	0634	1955	0847	1938	0947	2058	1117	2143	1101
11	1412	0431	1539	0546	1428	0422	1616	0419	1711	0338	1939	0409	2018	0512	2031	0746	2027	0954	2024	1050	2157	1157	2241	1128
12	1458	0527	1639	0623	1529	0456	1719	0445	1822	0409	2045	0511	2100	0630	2059	0855	2104	1100	2115	1148	2256	1231	2337	1153
13	1551	0620	1740	0655	1629	0525	1823	0511	1935	0445	2142	0622	2135	0746	2128	1001	2145	1203	2211	1239	2354	1301		1216
14	1646	0706	1840	0724	1730	0552	1931	0540	2050	0530	2227	0738	2205	0858	2157	1106	2233	1303	2310	1323		1327	0034	1240
15	1747	0747	1940	0750	1831	0618	2042	0612	2159	0625	2305	0853	2233	1006	2230	1210	2325	1358		1401	0052	1352	0132	1306
16	1847	0822	2040	0815	1933	0643	2155	0652	2300	0730	2336	1005	2300	1111	2308	1313		1446	0009	1433	0149	1416	0234	1334
17	1947	0853	2142	0840	2038	0710	2306	0739	2350	0841		1113	2327	1215	2351	1414	0022	1527	0108	1501	0248	1441	0340	1408
18	2046	0920	2246	0907	2145	0739		0836		0955	0004	1218	2357	1317		1512	0121	1602	0207	1526	0349	1508	0449	1449
19	2145	0946	2353	0937	2255	0813	0013	0942	0031	1107	0031	1320		1420	0040	1603	0221	1632	0305	1551	0454	1539	0601	1540
20	2246	1011		1013		0854	0106	1053	0104	1215	0057	1422	0031	1521	0134	1648	0320	1659	0403	1615	0602	1616	0712	1643
21	2348	1036	0103	1056	0006	0943	0152	1205	0134	1321	0125	1524	0110	1621	0231	1727	0418	1724	0503	1641	0713	1701	0815	1754
22		1104	0214	1148	0114	1042	0229	1315	0201	1424	0156	1626	0154	1716	0330	1801	0516	1748	0606	1709	0825	1757	0909	1910
23	0054	1136	0322	1252	0215	1150	0352	1422	0227	1526	0231	1727	0245	1806	0430	1830	0615	1813	0712	1742	0931	1902	0953	2026
24	0203	1215	0422	1403	0308	1302	0430	1528	0253	1628	0311	1826	0340	1849	0528	1856	0715	1839	0820	1822	1029	2014	1030	2138
25	0316	1303	0513	1516	0352	1415	0457	1631	0322	1731	0358	1920	0438	1926	0626	1920	0817	1908	0930	1910	1117	2128	1101	2247
26	0429	1402	0555	1633	0428	1526	0423	1734	0354	1833	0450	2008	0537	1958	0724	1944	0923	1942	1038	2007	1156	2239	1129	2353
27	0536	1512	0630	1745	0500	1634	0451	1838	0431	1934	0546	2049	0636	2026	0822	2009	1031	2023	1140	2113	1229	2348	1157	
28	0635	1628	0701	1853	0528	1740	0521	1941	0513	2032	0645	2125	0734	2051	0922	2035	1140	2113	1233	2224	1259		1224	0058
29	0723	1745			0555	1845	0555	2044	0602	2125	0744	2155	0831	2115	1025	2105	1245	2213	1318	2336	1326	0055	1254	0202
30	0802	1859			0622	1949	0634	2145	0656	2211	0842	2222	0929	2139	1130	2141	1345	2321	1355		1353	0200	1328	0307
31	0835	2009			0651	2053			0753	2250			1027	2204	1239	2225			1427	0047			1406	0411

TABLE 4
POINT MUGU TIDES
JANUARY 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0314	2.1	0924	7.0	1654	-1.7	2322	4.1
2	0410	2.1	1013	6.6	1738	-1.3	----	---
3	0013	4.2	0510	2.2	1105	5.9	1823	-.8
4	0100	4.3	0623	2.2	1158	5.0	1906	-.1
5	0152	4.5	0741	2.2	1304	4.1	1954	.6
6	0245	4.7	0918	1.9	1431	3.4	2040	1.2
7	0336	4.9	1050	1.4	1623	2.9	2133	1.8
8	0426	5.1	1207	.8	1809	2.9	2231	2.2
9	0514	5.3	1256	.3	1924	3.1	2324	2.5
10	0554	5.4	1338	-.1	2016	3.2	----	---
11	0015	2.5	0634	5.6	1416	-.4	2051	3.4
12	0057	2.5	0711	5.8	1445	-.6	2120	3.4
13	0132	2.5	0743	5.9	1517	-.7	2148	3.5
14	0208	2.5	0815	6.0	1548	-.7	2217	3.5
15	0240	2.4	0847	5.9	1614	-.7	2242	3.6
16	0316	2.3	0919	5.8	1642	-.6	2310	3.7
17	0351	2.3	0951	5.6	1712	-.4	2339	3.8
18	0430	2.3	1023	5.2	1736	-.1	----	---
19	0006	3.9	0520	2.3	1059	4.7	1803	.3
20	0042	4.1	0619	2.2	1144	4.0	1834	.8
21	0118	4.3	0735	2.1	1246	3.3	1906	1.3
22	0203	4.5	0918	1.7	1432	2.7	1948	1.9
23	0300	4.8	1053	1.0	1701	2.6	2047	2.3
24	0400	5.2	1203	.2	1844	2.9	2218	2.5
25	0503	5.7	1257	-.6	1939	3.3	2337	2.5
26	0559	6.2	1344	-1.2	2019	3.6	----	---
27	0038	2.4	0654	6.7	1426	-1.7	2057	3.9
28	0134	2.0	0745	6.9	1508	-1.9	2133	4.
29	0227	1.7	0831	7.0	1548	-1.8	2208	4.3
30	0317	1.5	0916	6.8	1627	-1.5	2243	4.5
31	0406	1.3	1004	6.2	1702	-1.0	2322	4.7

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 5
SAN NICOLAS ISLAND TIDES
JANUARY 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0324	1.8	0931	6.2	1704	-1.5	2329	3.7
2	0420	1.8	1020	5.9	1748	-1.1	----	---
3	0020	3.8	0520	1.9	1112	5.3	1833	-.7
4	0107	3.9	0633	1.9	1205	4.5	1916	-.1
5	0159	4.0	0751	1.9	1311	3.7	2004	.5
6	0252	4.2	0928	1.7	1438	3.1	2050	1.1
7	0343	4.4	1100	1.2	1630	2.6	2143	1.6
8	0433	4.6	1217	.7	1816	2.6	2241	1.9
9	0521	4.8	1306	.3	1931	2.8	2334	2.2
10	0601	4.8	1348	-.1	2023	2.9	----	---
11	0025	2.3	0641	5.0	1426	-.4	2058	3.1
12	0107	2.3	0718	5.2	1455	-.5	2127	3.1
13	0142	2.3	0750	5.3	1527	-.6	2155	3.2
14	0218	2.2	0822	5.4	1558	-.6	2224	3.2
15	0250	2.1	0854	5.3	1624	-.6	2249	3.3
16	0326	2.0	0926	5.2	1652	-.5	2317	3.3
17	0401	2.0	0958	5.0	1722	-.4	2346	3.4
18	0440	2.0	1030	4.7	1746	-.1	----	---
19	0013	3.5	0530	2.0	1106	4.2	1813	.3
20	0049	3.7	0629	1.9	1151	3.6	1844	.7
21	0125	3.9	0745	1.8	1253	3.0	1916	1.1
22	0210	4.0	0928	1.5	1439	2.5	1958	1.7
23	0307	4.3	1103	.9	1708	2.4	2057	2.0
24	0407	4.7	1213	.2	1851	2.6	2228	2.3
25	0510	5.1	1307	-.5	1946	3.0	2347	2.3
26	0606	5.5	1354	-1.1	2026	3.3	----	---
27	0048	2.1	0701	6.0	1436	-1.5	2104	3.5
28	0144	1.8	0752	6.2	1518	-1.7	2140	3.7
29	0237	1.5	0838	6.2	1558	-1.6	2215	3.9
30	0327	1.3	0923	6.1	1637	-1.3	2250	4.0
31	0416	1.1	1011	5.5	1712	-.9	2329	4.2

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 6

POINT MUGU TIDES
FEBRUARY 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0459	1.3	1050	5.5	1738	-.4	0000	4.7*
2	0557	1.4	1139	4.6	1813	.4	----	---
3	0040	4.7	0703	1.5	1236	3.7	1845	1.1
4	0125	4.7	0829	1.5	1357	2.9	1917	1.8
5	0218	4.6	1018	1.2	1630	2.5	1958	2.4
6	0322	4.6	1143	.8	1900	2.8	2131	2.7
7	0431	4.7	1243	.3	1952	3.1	2314	2.8
8	0532	4.9	1326	-.1	2019	3.3	----	---
9	0017	2.7	0618	5.2	1358	-.4	2041	3.5
10	0100	2.5	0659	5.4	1428	-.6	2058	3.6
11	0134	2.3	0732	5.7	1456	-.7	2116	3.7
12	0208	2.1	0804	5.8	1518	-.7	2134	3.9
13	0237	1.8	0836	5.8	1543	-.7	2156	4.0
14	0312	1.6	0907	5.6	1604	-.5	2218	4.2
15	0347	1.5	0939	5.3	1630	-.2	2240	4.3
16	0425	1.4	1014	4.9	1651	.2	2305	4.5
17	0505	1.3	1053	4.3	1714	.7	2333	4.6
18	0600	1.2	1139	3.6	1738	1.2	----	---
19	0008	4.7	0706	1.2	1244	2.9	1800	1.7
20	0051	4.8	0845	1.0	1455	2.5	1827	2.3
21	0158	4.8	1035	.5	----	---	----	---
22	0325	5.0	1151	-.1	1905	3.1	2221	2.8
23	0449	5.4	1246	-.8	1935	3.5	2351	2.5
24	0556	5.9	1331	-1.2	2000	3.8	----	---
25	0049	2.1	0649	6.3	1409	-1.5	2032	4.2
26	0139	1.5	0739	6.5	1444	-1.5	2100	4.5
27	0226	1.0	0825	6.4	1520	-1.3	2129	4.8
28	0312	.7	0910	6.1	1552	-.9	2200	5.0

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 7

SAN NICOLAS ISLAND TIDES
FEBRUARY 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0509	1.1	1057	4.9	1748	-.4	0007	4.2*
2	0607	1.2	1146	4.1	1823	.4	----	---
3	0047	4.2	0713	1.3	1243	3.3	1855	1.0
4	0132	4.2	0839	1.3	1404	2.6	1927	1.6
5	0225	4.1	1028	1.1	1637	2.3	2008	2.1
6	0329	4.1	1153	.7	1907	2.6	2141	2.5
7	0438	4.2	1253	.3	1959	2.8	2324	2.6
8	0539	4.4	1336	-.1	2026	3.0	----	---
9	0027	2.5	0625	4.7	1408	-.4	2048	3.2
10	0110	2.3	0706	4.8	1438	-.5	2105	3.3
11	0144	2.0	0739	5.1	1506	-.6	2123	3.3
12	0218	1.8	0811	5.2	1528	-.6	2141	3.5
13	0247	1.6	0843	5.2	1553	-.6	2203	3.6
14	0322	1.4	0914	5.0	1614	-.4	2225	3.8
15	0357	1.3	0946	4.8	1640	-.2	2247	3.9
16	0435	1.2	1021	4.4	1701	.2	2312	4.0
17	0515	1.1	1100	3.9	1724	.6	2340	4.1
18	0610	1.1	1146	3.3	1748	1.1	----	---
19	0015	4.2	0716	1.1	1251	2.6	1810	1.5
20	0058	4.3	0855	.9	1502	2.2	1837	2.0
21	0205	4.3	1045	.4	----	---	----	---
22	0332	4.5	1201	-.1	1912	2.8	2231	2.6
23	0456	4.8	1256	-.7	1942	3.2	0001	2.3*
24	0603	5.3	1341	-1.1	2007	3.4	----	---
25	0059	1.8	0656	5.6	1419	-1.3	2039	3.8
26	0149	1.3	0746	5.8	1454	-1.3	2107	4.0
27	0236	.9	0832	5.7	1530	-1.1	2136	4.3
28	0322	.6	0917	5.5	1602	-.8	2207	4.5

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 8

POINT MUGU TIDES
MARCH 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0356	.5	0952	5.5	1620	-.4	2230	5.1
2	0443	.4	1034	4.8	1651	.3	2302	5.1
3	0531	.5	1121	4.0	1716	1.0	2334	5.0
4	0624	.7	1216	3.2	1738	1.6	----	---
5	0006	4.8	0736	.9	1343	2.6	1750	2.2
6	0051	4.5	0923	1.0	----	---	----	---
7	0159	4.2	1108	.8	----	---	----	---
8	0340	4.2	1212	.4	1940	3.3	2319	2.9
9	0503	4.4	1255	0.0	1952	3.5	----	---
10	0015	2.6	0559	4.7	1326	-.2	2000	3.6
11	0054	2.3	0637	5.0	1353	-.4	2015	3.8
12	0123	1.9	0716	5.3	1417	-.5	2030	4.0
13	0155	1.5	0748	5.4	1439	-.4	2048	4.3
14	0227	1.1	0820	5.3	1501	-.3	2106	4.6
15	0259	.8	0856	5.2	1523	-.1	2128	4.8
16	0334	.5	0928	4.8	1545	.3	2150	5.0
17	0414	.3	1009	4.4	1606	.7	2216	5.2
18	0456	.2	1054	3.8	1631	1.2	2246	5.2
19	0550	.2	1150	3.2	1652	1.7	2323	5.2
20	0659	.3	1321	2.6	1717	2.2	----	---
21	0011	5.0	0832	.3	----	---	----	---
22	0128	4.8	1013	0.0	----	---	----	---
23	0312	4.8	1130	-.4	1841	3.4	2250	2.7
24	0444	5.0	1220	-.7	1903	3.9	0001	2.2*
25	0548	5.4	1302	-1.0	1928	4.3	----	---
26	0054	1.5	0645	5.6	1339	-1.0	1953	4.7
27	0139	.8	0731	5.6	1411	-.8	2021	5.0
28	0221	.3	0816	5.4	1443	-.4	2048	5.3
29	0303	-.1	0900	5.1	1510	0.0	2115	5.5
30	0342	-.3	0942	4.6	1537	.5	2141	5.5
31	0424	-.3	1026	4.0	1602	1.1	2209	5.4

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 9

SAN NICOLAS ISLAND TIDES
MARCH 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0406	.4	0959	4.9	1630	-.4	2237	4.6
2	0453	.4	1041	4.3	1701	.3	2309	4.6
3	0541	.4	1128	3.6	1726	.9	2341	4.5
4	0634	.6	1223	2.9	1748	1.4	----	---
5	0013	4.3	0746	.8	1350	2.4	1800	1.9
6	0058	4.0	0933	.9	----	---	----	---
7	0206	3.8	1118	.7	----	---	----	---
8	0347	3.8	1222	.4	1947	3.0	2329	2.6
9	0510	4.0	1305	0.0	1959	3.2	----	---
10	0025	2.4	0606	4.2	1336	-.2	2007	3.3
11	0104	2.0	0644	4.5	1403	-.4	2022	3.4
12	0133	1.7	0723	4.8	1427	-.4	2037	3.6
13	0205	1.3	0755	4.8	1449	-.4	2055	3.9
14	0237	1.0	0827	4.8	1511	-.3	2113	4.1
15	0309	.7	0903	4.7	1533	-.1	2135	4.3
16	0344	.4	0935	4.3	1555	.3	2157	4.5
17	0424	.3	1016	4.0	1616	.6	2223	4.7
18	0506	.2	1101	3.4	1641	1.1	2253	4.7
19	0600	.2	1157	2.9	1702	1.5	2330	4.7
20	0709	.3	1328	2.4	1727	1.9	----	---
21	0018	4.5	0842	.3	----	---	----	---
22	0135	4.3	1023	0.0	----	---	----	---
23	0319	4.3	1140	-.4	1848	3.1	2300	2.5
24	0451	4.5	1230	-.6	1910	3.5	0011	1.9*
25	0555	4.8	1312	-.9	1935	3.9	----	---
26	0104	1.3	0652	5.0	1349	-.9	2000	4.2
27	0149	.7	0738	5.0	1421	-.7	2028	4.5
28	0231	.3	0823	4.8	1453	-.4	2055	4.8
29	0313	-.1	0907	4.6	1520	0.0	2122	4.9
30	0352	-.3	0949	4.1	1547	.4	2148	4.9
31	0434	-.3	1033	3.6	1612	1.0	2216	4.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 10

POINT MUGU TIDES
APRIL 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0508	-.1	1113	3.5	1624	1.6	2236	5.2
2	0558	.1	1212	2.9	1635	2.1	2307	4.9
3	0656	.5	1357	2.6	1633	2.5	2342	4.5
4	0823	.7	----	---	----	---	----	---
5	0042	4.1	1006	.6	----	---	----	---
6	0234	3.9	1114	.4	1854	3.4	2304	2.9
7	0418	4.0	1201	.2	1903	3.6	2354	2.5
8	0519	4.2	1233	.1	1911	3.8	----	---
9	0030	2.0	0608	4.5	1302	0.0	1922	4.1
10	0105	1.5	0647	4.6	1326	0.0	1937	4.5
11	0138	.9	0726	4.7	1349	.1	1956	4.8
12	0209	.4	0804	4.6	1414	.3	2017	5.2
13	0244	-.1	0843	4.5	1436	.6	2040	5.5
14	0323	-.4	0926	4.2	1502	1.0	2106	5.7
15	0404	-.7	1012	3.8	1530	1.4	2138	5.8
16	0454	-.7	1108	3.4	1558	1.8	2214	5.7
17	0550	-.6	1221	3.0	1630	2.3	2256	5.5
18	0659	-.4	1410	2.8	1705	2.6	2355	5.2
19	0821	-.3	1621	3.0	1838	2.9	----	---
20	0120	4.8	0944	-.4	1716	3.5	2122	2.9
21	0300	4.6	1052	-.4	1748	3.9	2300	2.4
22	0429	4.6	1143	-.5	1820	4.4	0000	1.6*
23	0538	4.7	1225	-.4	1848	4.8	----	---
24	0052	.9	0633	4.7	1300	-.1	1914	5.2
25	0134	.3	0726	4.6	1332	.2	1941	5.5
26	0216	-.2	0812	4.4	1401	.6	2007	5.7
27	0254	-.6	0858	4.1	1429	1.0	2035	5.8
28	0333	-.7	0941	3.8	1454	1.5	2100	5.8
29	0412	-.7	1027	3.5	1516	1.8	2125	5.6
30	0451	-.5	1118	3.1	1541	2.2	2156	5.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 11

SAN NICOLAS ISLAND TIDES
APRIL 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0518	-.1	1120	3.2	1634	1.4	2243	4.7
2	0608	.1	1219	2.6	1645	1.8	2314	4.4
3	0706	.4	1404	2.4	1643	2.2	2349	4.0
4	0833	.6	----	---	----	---	----	---
5	0049	3.7	1016	.5	----	---	----	---
6	0241	3.5	1124	.4	1901	3.1	2314	2.6
7	0425	3.6	1211	.2	1910	3.3	0004	2.3*
8	0526	3.8	1243	.1	1918	3.4	----	---
9	0040	1.8	0615	4.0	1312	0.0	1929	3.7
10	0115	1.3	0654	4.1	1336	0.0	1944	4.0
11	0148	.8	0733	4.2	1359	.1	2003	4.3
12	0219	.4	0811	4.1	1424	.3	2024	4.7
13	0254	-.1	0850	4.0	1446	.5	2047	4.9
14	0333	-.4	0933	3.8	1512	.9	2113	5.1
15	0414	-.6	1019	3.4	1540	1.2	2145	5.2
16	0504	-.6	1115	3.1	1608	1.6	2221	5.1
17	0600	-.5	1228	2.7	1640	2.0	2303	4.9
18	0709	-.4	1417	2.6	1715	2.4	0002	4.7*
19	0831	-.3	1628	2.7	1848	2.6	----	---
20	0127	4.3	0954	-.4	1723	3.2	2132	2.6
21	0307	4.1	1102	-.4	1755	3.5	2310	2.1
22	0436	4.1	1153	-.4	1827	4.0	0010	1.4*
23	0545	4.2	1235	-.4	1855	4.3	----	---
24	0102	.8	0640	4.2	1310	-.1	1921	4.7
25	0144	.3	0733	4.1	1342	.2	1948	4.9
26	0226	-.2	0819	4.0	1411	.5	2014	5.1
27	0304	-.5	0905	3.7	1439	.9	2042	5.2
28	0343	-.6	0948	3.4	1504	1.3	2107	5.2
29	0422	-.6	1034	3.2	1526	1.6	2132	5.0
30	0501	-.4	1125	2.8	1551	1.9	2203	4.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 12
POINT MUGU TIDES
MAY 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0536	-.2	1221	2.9	1556	2.5	2228	5.0
2	0632	.1	2304	4.6	----	---	----	---
3	0741	.3	2358	4.2	----	---	----	---
4	0851	.4	----	---	----	---	----	---
5	0124	3.9	0958	.5	1743	3.5	2216	2.9
6	0304	3.7	1047	.5	1753	3.8	2319	2.5
7	0424	3.7	1124	.5	1807	4.1	0004	1.9*
8	0524	3.8	1156	.6	1822	4.5	----	---
9	0040	1.2	0618	3.9	1225	.7	1841	4.9
10	0115	.5	0705	3.9	1253	.9	1905	5.4
11	0154	-.1	0753	3.9	1323	1.1	1930	5.8
12	0232	-.7	0839	3.9	1353	1.4	2001	6.1
13	0314	-1.1	0932	3.7	1426	1.7	2035	6.3
14	0400	-1.3	1025	3.5	1504	2.0	2115	6.3
15	0451	-1.4	1126	3.3	1543	2.3	2200	6.2
16	0547	-1.2	1239	3.2	1632	2.5	2251	5.8
17	0650	-1.0	1404	3.3	1744	2.8	2355	5.3
18	0757	-.7	1518	3.6	1930	2.8	----	---
19	0114	4.8	0904	-.5	1613	4.0	2122	2.5
20	0244	4.4	1002	-.2	1655	4.4	2252	2.0
21	0410	4.1	1050	.1	1731	4.9	2353	1.2
22	0527	3.9	1137	.5	1804	5.3	----	---
23	0046	.5	0630	3.8	1214	.9	1834	5.6
24	0129	-.1	0726	3.7	1246	1.3	1903	5.8
25	0211	-.5	0816	3.6	1322	1.6	1932	5.9
26	0249	-.7	0905	3.5	1350	1.9	2000	6.0
27	0327	-.8	0948	3.4	1419	2.2	2029	5.9
28	0403	-.8	1035	3.3	1447	2.4	2058	5.7
29	0441	-.6	1127	3.1	1516	2.5	2133	5.5
30	0521	-.4	1219	3.1	1544	2.7	2209	5.3
31	0606	-.2	1324	3.1	1623	2.9	2244	4.9

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 13
SAN NICOLAS ISLAND TIDES
MAY 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0546	-.2	1228	2.6	1606	2.2	2235	4.5
2	0642	.1	2311	4.1	----	---	----	---
3	0751	.3	0005	3.8	----	---	----	---
4	0901	.4	----	---	----	---	----	---
5	0131	3.5	1008	.4	1750	3.2	2226	2.6
6	0311	3.3	1057	.4	1800	3.4	2329	2.2
7	0431	3.3	1134	.4	1814	3.7	0014	1.7*
8	0531	3.4	1206	.5	1829	4.0	----	---
9	0050	1.1	0625	3.5	1235	.6	1848	4.4
10	0125	.4	0712	3.5	1303	.8	1912	4.8
11	0204	-.1	0800	3.5	1333	1.0	1937	5.2
12	0242	-.6	0846	3.5	1403	1.2	2008	5.5
13	0324	-1.0	0939	3.3	1436	1.5	2042	5.6
14	0410	-1.1	1032	3.2	1514	1.8	2122	5.6
15	0501	-1.2	1133	3.0	1553	2.0	2207	5.5
16	0557	-1.1	1246	2.9	1642	2.3	2258	5.2
17	0700	-.9	1411	3.0	1754	2.6	0002	4.8*
18	0807	-.6	1525	3.3	1940	2.6	----	---
19	0121	4.3	0914	-.4	1620	3.6	2132	2.3
20	0251	4.0	1012	-.2	1702	4.0	2302	1.8
21	0417	3.7	1100	.1	1738	4.4	0003	1.1*
22	0534	3.5	1147	.4	1811	4.8	----	---
23	0056	.4	0637	3.4	1224	.8	1841	5.0
24	0139	-.1	0733	3.3	1256	1.1	1910	5.2
25	0221	-.4	0823	3.3	1332	1.4	1939	5.3
26	0259	-.6	0912	3.2	1400	1.7	2007	5.4
27	0337	-.7	0955	3.1	1429	1.9	2036	5.3
28	0413	-.7	1042	3.0	1457	2.1	2105	5.1
29	0451	-.5	1134	2.8	1526	2.3	2140	4.9
30	0531	-.4	1226	2.8	1554	2.5	2216	4.8
31	0616	-.2	1331	2.8	1633	2.6	2251	4.4

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 14

POINT MUGU TIDES
JUNE 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0656	0.0	1434	3.2	1726	3.0	2331	4.5
2	0745	.3	1533	3.4	1904	3.1	----	---
3	0028	4.1	0834	.5	1605	3.7	2100	2.9
4	0148	3.7	0917	.7	1629	4.0	2230	2.5
5	0318	3.4	1002	1.0	1652	4.4	2328	1.8
6	0440	3.3	1040	1.2	1719	4.9	----	---
7	0014	1.0	0552	3.3	1119	1.5	1745	5.3
8	0059	.3	0655	3.4	1157	1.7	1820	5.8
9	0142	-.5	0750	3.5	1239	1.9	1855	6.3
10	0224	-1.1	0843	3.6	1321	2.1	1935	6.6
11	0309	-1.5	0937	3.6	1403	2.2	2021	6.8
12	0358	-1.7	1033	3.6	1452	2.3	2106	6.8
13	0447	-1.7	1125	3.7	1544	2.4	2156	6.6
14	0539	-1.5	1224	3.7	1644	2.5	2251	6.1
15	0631	-1.2	1319	3.9	1759	2.5	2350	5.5
16	0722	-.7	1418	4.2	1930	2.5	----	---
17	0100	4.8	0815	-.2	1511	4.5	2104	2.2
18	0222	4.1	0906	.4	1559	4.9	2232	1.6
19	0354	3.5	0958	1.0	1641	5.2	2342	1.0
20	0520	3.3	1047	1.5	1724	5.5	----	---
21	0038	.4	0638	3.2	1130	1.9	1759	5.7
22	0126	-.1	0740	3.3	1212	2.2	1836	5.9
23	0208	-.4	0833	3.3	1250	2.4	1907	6.0
24	0244	-.6	0918	3.4	1326	2.5	1940	6.0
25	0322	-.7	0956	3.4	1400	2.5	2014	6.0
26	0354	-.7	1033	3.4	1435	2.5	2047	5.9
27	0428	-.6	1110	3.4	1511	2.6	2121	5.8
28	0502	-.5	1147	3.4	1549	2.6	2154	5.5
29	0536	-.3	1224	3.5	1633	2.7	2232	5.2
30	0611	0.0	1301	3.6	1724	2.8	2307	4.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 15

SAN NICOLAS ISLAND TIDES
JUNE 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0706	0.0	1441	2.9	1736	2.7	2338	4.0
2	0755	.3	1540	3.1	1914	2.8	----	---
3	0035	3.7	0844	.4	1612	3.3	2110	2.6
4	0155	3.3	0927	.6	1636	3.6	2240	2.2
5	0325	3.1	1012	.9	1659	4.0	2338	1.6
6	0447	3.0	1050	1.1	1726	4.4	----	---
7	0024	.9	0559	3.0	1129	1.3	1752	4.8
8	0109	.3	0702	3.1	1207	1.5	1827	5.2
9	0152	-.4	0757	3.2	1249	1.7	1902	5.6
10	0234	-1.0	0850	3.3	1331	1.8	1942	5.9
11	0319	-1.3	0944	3.3	1413	1.9	2028	6.1
12	0408	-1.5	1040	3.3	1502	2.0	2113	6.1
13	0457	-1.5	1132	3.3	1554	2.1	2203	5.9
14	0549	-1.3	1231	3.3	1654	2.2	2258	5.5
15	0641	-1.1	1326	3.5	1809	2.3	2357	4.9
16	0732	-.6	1425	3.8	1940	2.2	----	---
17	0107	4.3	0825	-.2	1518	4.0	2114	1.9
18	0229	3.7	0916	.4	1606	4.4	2242	1.4
19	0401	3.2	1008	.9	1648	4.7	2352	.9
20	0527	3.0	1057	1.3	1731	4.9	----	---
21	0048	.4	0645	2.9	1140	1.7	1806	5.1
22	0136	-.1	0747	3.0	1222	1.9	1843	5.3
23	0218	-.4	0840	3.0	1300	2.1	1914	5.4
24	0254	-.5	0925	3.1	1336	2.2	1947	5.4
25	0332	-.6	1003	3.1	1410	2.3	2021	5.4
26	0404	-.6	1040	3.1	1445	2.3	2054	5.3
27	0438	-.5	1117	3.1	1521	2.4	2128	5.2
28	0512	-.4	1154	3.1	1558	2.4	2201	4.9
29	0546	-.3	1231	3.2	1643	2.5	2239	4.7
30	0621	0.0	1308	3.3	1734	2.6	2314	4.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 16
POINT MUGU TIDES
JULY 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0645	.3	1339	3.8	1834	2.8	2357	4.3
2	0717	.7	1418	4.0	1954	2.6	----	---
3	0053	3.7	0752	1.1	1456	4.3	2130	2.3
4	0221	3.2	0832	1.5	1535	4.7	2250	1.7
5	0407	2.9	0920	1.9	1617	5.1	2352	.9
6	0548	2.9	1016	2.2	1700	5.6	----	---
7	0041	.1	0702	3.1	1111	2.4	1746	6.1
8	0130	-.6	0757	3.4	1210	2.5	1835	6.6
9	0215	-1.2	0846	3.6	1307	2.4	1923	6.9
10	0302	-1.6	0932	3.8	1358	2.3	2012	7.1
11	0345	-1.7	1014	4.0	1452	2.2	2101	7.1
12	0430	-1.7	1058	4.2	1550	2.1	2153	6.8
13	0514	-1.4	1144	4.4	1646	2.0	2243	6.2
14	0557	-.9	1227	4.6	1752	2.0	2338	5.4
15	0642	-.2	1315	4.8	1905	2.0	----	---
16	0040	4.5	0724	.5	1404	4.9	2034	1.8
17	0157	3.7	0806	1.2	1456	5.1	2208	1.4
18	0339	3.1	0858	1.9	1550	5.3	2327	.9
19	0535	3.0	0957	2.4	1642	5.4	----	---
20	0031	.4	0703	3.2	1100	2.6	1732	5.6
21	0121	0.0	0803	3.4	1156	2.7	1815	5.7
22	0200	-.3	0842	3.5	1247	2.7	1857	5.9
23	0235	-.4	0910	3.6	1323	2.6	1930	6.0
24	0306	-.5	0939	3.7	1401	2.5	2006	6.0
25	0336	-.5	1004	3.8	1434	2.5	2037	6.0
26	0404	-.5	1029	3.8	1509	2.4	2109	5.9
27	0430	-.3	1054	3.9	1545	2.4	2141	5.7
28	0457	-.1	1119	4.1	1624	2.4	2214	5.3
29	0521	.2	1147	4.2	1707	2.3	2249	4.8
30	0544	.6	1216	4.3	1802	2.3	2330	4.2
31	0611	1.1	1248	4.5	1912	2.2	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 17
SAN NICOLAS ISLAND TIDES
JULY 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0655	.3	1346	3.4	1844	2.6	0004	3.9*
2	0727	.6	1425	3.6	2004	2.4	----	---
3	0100	3.3	0802	1.0	1503	3.9	2140	2.0
4	0228	2.9	0842	1.3	1542	4.2	2300	1.5
5	0414	2.6	0930	1.7	1624	4.6	0002	.8*
6	0555	2.6	1026	1.9	1707	5.0	----	---
7	0051	.1	0709	2.8	1121	2.1	1753	5.5
8	0140	-.5	0804	3.1	1220	2.2	1842	5.9
9	0225	-1.1	0853	3.3	1317	2.1	1930	6.2
10	0312	-1.4	0939	3.4	1408	2.0	2019	6.3
11	0355	-1.5	1021	3.6	1502	1.9	2108	6.3
12	0440	-1.5	1105	3.8	1600	1.8	2200	6.1
13	0524	-1.2	1151	4.0	1656	1.8	2250	5.5
14	0607	-.8	1234	4.1	1802	1.8	2345	4.8
15	0652	-.2	1322	4.3	1915	1.8	----	---
16	0047	4.0	0734	.4	1411	4.4	2044	1.6
17	0204	3.3	0816	1.1	1503	4.6	2218	1.2
18	0346	2.8	0908	1.7	1557	4.8	2337	.8
19	0542	2.7	1007	2.1	1649	4.8	----	---
20	0041	.4	0710	2.9	1110	2.4	1739	5.0
21	0131	0.0	0810	3.1	1206	2.5	1822	5.1
22	0210	-.3	0849	3.2	1257	2.5	1904	5.3
23	0245	-.4	0917	3.3	1333	2.4	1937	5.4
24	0316	-.4	0946	3.3	1411	2.3	2013	5.4
25	0346	-.4	1011	3.4	1444	2.2	2044	5.4
26	0414	-.4	1036	3.4	1519	2.1	2116	5.3
27	0440	-.3	1101	3.5	1555	2.1	2148	5.1
28	0507	-.1	1126	3.7	1634	2.1	2221	4.8
29	0531	.2	1154	3.8	1717	2.0	2256	4.3
30	0554	.5	1223	3.9	1812	2.0	2337	3.8
31	0621	1.0	1255	4.0	1922	1.9	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 18
POINT MUGU TIDES
AUGUST 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0026	3.6	0637	1.6	1329	4.7	2038	2.0
2	0150	3.0	0711	2.1	1419	4.9	2217	1.4
3	0418	2.7	0757	2.5	1522	5.2	2332	.7
4	0622	3.0	0926	2.7	1629	5.7	----	---
5	0032	0.0	0717	3.3	1100	2.8	1729	6.1
6	0118	-.7	0756	3.7	1209	2.6	1826	6.6
7	0203	-1.2	0833	4.0	1310	2.4	1918	7.0
8	0245	-1.4	0906	4.3	1400	2.0	2007	7.2
9	0324	-1.5	0941	4.6	1452	1.7	2056	7.0
10	0402	-1.2	1017	4.8	1543	1.4	2142	6.6
11	0438	-.8	1054	5.1	1635	1.3	2230	5.9
12	0515	-.1	1131	5.2	1734	1.3	2322	5.1
13	0549	.6	1212	5.3	1838	1.3	----	---
14	0021	4.1	0621	1.4	1255	5.2	1956	1.4
15	0140	3.4	0700	2.1	1348	5.1	2134	1.3
16	0356	3.0	0745	2.6	1451	5.0	2308	.9
17	0626	3.2	0911	3.0	1605	5.1	----	---
18	0017	.5	0726	3.5	1058	3.1	1712	5.2
19	0102	.2	0758	3.7	1204	3.0	1804	5.4
20	0140	0.0	0823	3.9	1249	2.7	1846	5.7
21	0210	-.2	0838	4.0	1326	2.5	1922	5.9
22	0239	-.3	0856	4.1	1358	2.3	1953	6.0
23	0304	-.2	0918	4.2	1427	2.1	2025	5.9
24	0326	-.1	0936	4.4	1459	1.9	2054	5.8
25	0348	.1	0958	4.6	1534	1.7	2126	5.5
26	0409	.3	1020	4.7	1609	1.6	2158	5.1
27	0428	.7	1043	4.9	1648	1.5	2236	4.6
28	0451	1.2	1107	5.0	1737	1.5	2318	4.0
29	0512	1.7	1139	5.0	1835	1.5	----	---
30	0019	3.3	0533	2.2	1219	5.1	2005	1.4
31	0214	2.8	0552	2.5	1313	5.1	2152	1.1

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 19
SAN NICOLAS ISLAND TIDES
AUGUST 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0033	3.3	0647	1.4	1336	4.2	2048	1.8
2	0157	2.7	0721	1.8	1426	4.4	2227	1.2
3	0425	2.5	0807	2.2	1529	4.7	2342	.6
4	0629	2.7	0936	2.5	1636	5.1	----	---
5	0042	0.0	0724	3.0	1110	2.6	1736	5.5
6	0128	-.6	0803	3.3	1219	2.4	1833	5.9
7	0213	-1.1	0840	3.6	1320	2.1	1925	6.2
8	0255	-1.2	0913	3.9	1410	1.8	2014	6.4
9	0334	-1.3	0948	4.1	1502	1.5	2103	6.2
10	0412	-1.1	1024	4.3	1553	1.2	2149	5.9
11	0448	-.7	1101	4.6	1645	1.1	2237	5.3
12	0525	-.1	1138	4.7	1744	1.1	2329	4.6
13	0559	.5	1219	4.8	1848	1.1	----	---
14	0028	3.7	0631	1.2	1302	4.7	2006	1.2
15	0147	3.1	0710	1.8	1355	4.6	2144	1.1
16	0403	2.7	0755	2.4	1458	4.5	2318	.8
17	0633	2.9	0921	2.7	1612	4.6	----	---
18	0027	.4	0733	3.2	1108	2.8	1719	4.7
19	0112	.2	0805	3.3	1214	2.7	1811	4.8
20	0150	0.0	0830	3.5	1259	2.5	1853	5.1
21	0220	-.2	0845	3.6	1336	2.3	1929	5.3
22	0249	-.3	0903	3.7	1408	2.0	2000	5.4
23	0314	-.2	0925	3.8	1437	1.8	2032	5.3
24	0336	-.1	0943	4.0	1509	1.7	2101	5.2
25	0358	.1	1005	4.1	1544	1.5	2133	4.9
26	0419	.3	1027	4.2	1619	1.4	2205	4.6
27	0438	.6	1050	4.4	1658	1.3	2243	4.1
28	0501	1.1	1114	4.5	1747	1.3	2325	3.6
29	0522	1.5	1146	4.5	1845	1.3	----	---
30	0026	3.0	0543	1.9	1226	4.6	2015	1.2
31	0221	2.6	0602	2.3	1320	4.6	2202	1.0

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 20

POINT MUGU TIDES
SEPTEMBER 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	1443	5.2	2316	.5	----	---	----	---
2	0647	3.4	0938	3.2	1613	5.5	----	---
3	0017	-.1	0708	3.8	1118	2.9	1722	6.0
4	0102	-.6	0733	4.1	1222	2.5	1822	6.4
5	0141	-.9	0802	4.5	1313	1.9	1913	6.7
6	0217	-1.0	0830	4.9	1400	1.3	2000	6.7
7	0252	-.8	0901	5.3	1447	.9	2047	6.4
8	0324	-.5	0931	5.6	1533	.6	2133	5.9
9	0356	.1	1003	5.7	1622	.5	2220	5.2
10	0428	.7	1035	5.7	1712	.5	2310	4.5
11	0454	1.4	1110	5.6	1810	.7	----	---
12	0006	3.7	0525	2.1	1146	5.4	1920	1.0
13	0140	3.1	0547	2.6	1235	5.0	2056	1.1
14	1346	4.7	2234	.9	----	---	----	---
15	1524	4.6	2343	.7	----	---	----	---
16	0707	3.8	1112	3.3	1647	4.8	----	---
17	0030	.4	0722	4.0	1207	2.9	1743	5.1
18	0107	.2	0737	4.2	1241	2.5	1825	5.3
19	0132	.1	0755	4.4	1313	2.2	1903	5.5
20	0157	.1	0810	4.6	1345	1.8	1935	5.5
21	0219	.2	0828	4.8	1415	1.4	2007	5.5
22	0241	.3	0844	5.0	1445	1.1	2039	5.3
23	0302	.6	0905	5.3	1519	.8	2115	5.0
24	0321	.9	0927	5.4	1553	.7	2151	4.6
25	0340	1.3	0948	5.6	1636	.6	2233	4.1
26	0404	1.8	1017	5.6	1721	.6	2326	3.6
27	0422	2.2	1049	5.5	1826	.7	----	---
28	0050	3.1	0441	2.6	1134	5.4	1950	.8
29	1242	5.2	2133	.6	----	---	----	---
30	1424	5.1	2252	.2	----	---	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 21

SAN NICOLAS ISLAND TIDES
SEPTEMBER 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	1450	4.7	2326	.4	----	---	----	---
2	0654	3.1	0948	2.9	1620	4.9	----	---
3	0027	-.1	0715	3.4	1128	2.6	1729	5.4
4	0112	-.5	0740	3.7	1232	2.2	1829	5.7
5	0151	-.8	0809	4.0	1323	1.7	1920	6.0
6	0227	-.9	0837	4.4	1410	1.1	2007	6.0
7	0302	-.7	0908	4.8	1457	.8	2054	5.7
8	0334	-.4	0938	5.0	1543	.5	2140	5.3
9	0406	.1	1010	5.1	1632	.4	2227	4.7
10	0438	.6	1042	5.1	1722	.4	2317	4.0
11	0504	1.2	1117	5.0	1820	.6	----	---
12	0013	3.3	0535	1.8	1153	4.8	1930	.9
13	0147	2.8	0557	2.4	1242	4.5	2106	1.0
14	1353	4.2	2244	.8	----	---	----	---
15	1531	4.1	2353	.6	----	---	----	---
16	0714	3.4	1122	3.0	1654	4.3	----	---
17	0040	.4	0729	3.6	1217	2.6	1750	4.6
18	0117	.2	0744	3.8	1251	2.3	1832	4.8
19	0142	.1	0802	4.0	1323	1.9	1910	4.9
20	0207	.1	0817	4.1	1355	1.6	1942	4.9
21	0229	.2	0835	4.3	1425	1.2	2014	4.9
22	0251	.3	0851	4.5	1455	1.0	2046	4.8
23	0312	.5	0912	4.8	1529	.7	2122	4.5
24	0331	.8	0934	4.8	1603	.6	2158	4.1
25	0350	1.1	0955	5.0	1646	.5	2240	3.7
26	0414	1.6	1024	5.0	1731	.5	2333	3.3
27	0432	1.9	1056	4.9	1836	.6	----	---
28	0057	2.8	0451	2.4	1141	4.8	2000	.7
29	1249	4.7	2143	.5	----	---	----	---
30	1431	4.6	2302	.2	----	---	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 22

POINT MUGU TIDES
OCTOBER 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0612	3.8	1014	3.2	1605	5.3	2346	-.2
2	0636	4.2	1132	2.6	1716	5.6	----	---
3	0031	-.4	0658	4.7	1228	2.0	1815	5.8
4	0107	-.4	0723	5.1	1313	1.2	1905	5.9
5	0142	-.3	0751	5.6	1357	.6	1953	5.8
6	0214	0.0	0820	5.9	1440	.1	2038	5.5
7	0245	.5	0848	6.1	1522	-.2	2124	5.0
8	0312	1.0	0917	6.2	1608	-.2	2209	4.5
9	0339	1.6	0946	6.1	1653	-.1	2302	3.9
10	0404	2.1	1017	5.8	1742	.2	----	---
11	0006	3.4	0426	2.5	1050	5.4	1848	.6
12	0201	3.1	0427	3.0	1131	5.0	2007	.8
13	1232	4.6	2141	.9	----	---	----	---
14	0630	3.7	0855	3.6	1421	4.3	2250	.7
15	0628	3.9	1100	3.3	1601	4.3	2340	.6
16	0636	4.2	1148	2.8	1706	4.5	----	---
17	0015	.5	0648	4.4	1223	2.3	1756	4.7
18	0041	.5	0703	4.7	1256	1.8	1834	4.8
19	0106	.6	0718	5.0	1328	1.3	1913	4.8
20	0129	.7	0736	5.3	1359	.8	1951	4.8
21	0151	1.0	0755	5.6	1432	.3	2027	4.6
22	0214	1.2	0816	5.9	1507	0.0	2108	4.4
23	0238	1.5	0842	6.1	1545	-.2	2151	4.1
24	0300	1.9	0910	6.2	1630	-.3	2244	3.7
25	0328	2.3	0946	6.1	1720	-.2	2354	3.3
26	0353	2.6	1024	5.9	1824	-.1	----	---
27	0133	3.1	0426	2.9	1118	5.6	1943	.1
28	1230	5.2	2104	.1	----	---	----	---
29	0453	3.8	0830	3.4	1412	4.9	2214	0.0
30	0522	4.2	1026	2.8	1548	4.8	2307	0.0
31	0550	4.7	1133	2.1	1704	4.9	2353	.1

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 23

SAN NICOLAS ISLAND TIDES
OCTOBER 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0619	3.4	1024	2.9	1612	4.8	2356	-.2
2	0643	3.8	1142	2.4	1723	5.0	----	---
3	0041	-.4	0705	4.2	1238	1.8	1822	5.2
4	0117	-.4	0730	4.6	1323	1.1	1912	5.3
5	0152	-.3	0758	5.0	1407	.5	2000	5.2
6	0224	0.0	0827	5.3	1450	.1	2045	4.9
7	0255	.4	0855	5.5	1532	-.2	2131	4.5
8	0322	.9	0924	5.5	1618	-.2	2216	4.0
9	0349	1.4	0953	5.5	1703	-.1	2309	3.5
10	0414	1.8	1024	5.2	1752	.2	----	---
11	0013	3.1	0436	2.3	1057	4.8	1858	.5
12	0208	2.8	0437	2.7	1138	4.5	2017	.7
13	1239	4.1	2151	.8	----	---	----	---
14	0637	3.3	0905	3.3	1428	3.9	2300	.6
15	0635	3.5	1110	3.0	1608	3.9	2350	.5
16	0643	3.8	1158	2.6	1713	4.0	----	---
17	0025	.4	0655	4.0	1233	2.0	1803	4.2
18	0051	.4	0710	4.2	1306	1.6	1841	4.3
19	0116	.5	0725	4.5	1338	1.1	1920	4.3
20	0139	.6	0743	4.8	1409	.7	1958	4.3
21	0201	.9	0802	5.0	1442	.3	2034	4.1
22	0224	1.1	0823	5.3	1517	0.0	2115	4.0
23	0248	1.3	0849	5.5	1555	-.2	2158	3.7
24	0310	1.7	0917	5.5	1640	-.3	2251	3.3
25	0338	2.0	0953	5.5	1730	-.2	0001	3.0*
26	0403	2.4	1031	5.3	1834	-.1	----	---
27	0140	2.8	0436	2.6	1125	5.0	1953	.1
28	1237	4.7	2114	.1	----	---	----	---
29	0500	3.4	0840	3.1	1419	4.4	2224	0.0
30	0529	3.8	1036	2.6	1555	4.3	2317	0.0
31	0557	4.2	1143	1.8	1711	4.4	0003	.1*

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 24

POINT MUGU TIDES
NOVEMBER 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0618	5.2	1226	1.3	1807	4.9	----	---
2	0030	.3	0647	5.7	1311	.6	1902	4.8
3	0102	.6	0715	6.1	1353	-.1	1951	4.7
4	0134	1.0	0742	6.3	1435	-.5	2038	4.4
5	0203	1.4	0811	6.4	1516	-.7	2124	4.1
6	0232	1.8	0840	6.4	1557	-.6	2213	3.8
7	0300	2.2	0911	6.2	1638	-.5	2307	3.5
8	0325	2.5	0939	5.9	1723	-.2	----	---
9	0013	3.3	0350	2.8	1012	5.5	1819	.1
10	0151	3.2	0405	3.1	1053	5.1	1920	.4
11	1142	4.6	2029	.6	----	---	----	---
12	0510	3.6	0745	3.5	1301	4.2	2135	.7
13	0522	3.9	1007	3.2	1444	3.9	2226	.8
14	0536	4.2	1116	2.7	1610	3.9	2306	.9
15	0551	4.5	1158	2.2	1716	3.9	2337	1.0
16	0609	4.9	1233	1.5	1808	3.9	0008	1.2*
17	0625	5.3	1309	.8	1854	4.0	----	---
18	0033	1.4	0647	5.7	1341	.2	1940	4.0
19	0102	1.6	0713	6.0	1419	-.3	2024	3.9
20	0131	1.8	0742	6.3	1458	-.7	2112	3.9
21	0202	2.0	0814	6.5	1540	-1.0	2201	3.7
22	0237	2.3	0850	6.6	1628	-1.0	2259	3.6
23	0313	2.5	0932	6.5	1718	-1.0	----	---
24	0006	3.4	0356	2.7	1020	6.2	1816	-.8
25	0122	3.5	0457	2.9	1118	5.8	1919	-.5
26	0238	3.7	0635	3.1	1227	5.2	2023	-.2
27	0337	4.1	0834	2.9	1354	4.6	2122	.1
28	0422	4.6	1012	2.4	1530	4.2	2219	.4
29	0501	5.1	1127	1.6	1656	4.0	2306	.8
30	0537	5.5	1222	.8	1805	3.9	2348	1.2

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 25

SAN NICOLAS ISLAND TIDES
NOVEMBER 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0625	4.7	1236	1.1	1814	4.4	----	---
2	0040	.3	0654	5.1	1321	.5	1909	4.3
3	0112	.5	0722	5.5	1403	-.1	1958	4.2
4	0144	.9	0749	5.6	1445	-.4	2045	4.0
5	0213	1.2	0818	5.7	1526	-.6	2131	3.7
6	0242	1.6	0847	5.7	1607	-.5	2220	3.4
7	0310	1.9	0918	5.5	1648	-.4	2314	3.2
8	0335	2.3	0946	5.3	1733	-.2	----	---
9	0020	3.0	0400	2.6	1019	4.9	1829	.1
10	0158	2.9	0415	2.8	1100	4.6	1930	.4
11	1149	4.1	2039	.5	----	---	----	---
12	0517	3.3	0755	3.2	1308	3.8	2145	.6
13	0529	3.5	1017	2.9	1451	3.5	2236	.7
14	0543	3.8	1126	2.5	1617	3.5	2316	.8
15	0558	4.0	1208	1.9	1723	3.5	2347	.9
16	0616	4.4	1243	1.3	1815	3.5	0018	1.1*
17	0632	4.8	1319	.7	1901	3.6	----	---
18	0043	1.2	0654	5.1	1351	.2	1947	3.6
19	0112	1.4	0720	5.4	1429	-.3	2031	3.5
20	0141	1.6	0749	5.6	1508	-.6	2119	3.5
21	0212	1.8	0821	5.8	1550	-.9	2208	3.3
22	0247	2.0	0857	5.9	1638	-.9	2306	3.3
23	0323	2.2	0939	5.8	1728	-.9	----	---
24	0013	3.1	0406	2.5	1027	5.5	1826	-.7
25	0129	3.2	0507	2.6	1125	5.2	1929	-.4
26	0245	3.3	0645	2.8	1234	4.7	2033	-.2
27	0344	3.7	0844	2.6	1401	4.1	2132	.1
28	0429	4.1	1022	2.1	1537	3.8	2229	.4
29	0508	4.6	1137	1.4	1703	3.6	2316	.7
30	0544	4.9	1232	.7	1812	3.5	2358	1.1

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 26

POINT MUGU TIDES
DECEMBER 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0609	5.9	1312	.1	1907	3.9	----	---
2	0026	1.5	0642	6.2	1354	-.4	2002	3.8
3	0058	1.8	0714	6.4	1433	-.7	2052	3.7
4	0134	2.1	0746	6.4	1512	-.9	2136	3.7
5	0206	2.4	0816	6.3	1550	-.8	2220	3.5
6	0237	2.5	0848	6.2	1628	-.7	2307	3.4
7	0306	2.6	0920	5.9	1708	-.5	2356	3.4
8	0341	2.8	0956	5.6	1750	-.2	----	---
9	0051	3.3	0420	2.9	1034	5.2	1832	.1
10	0154	3.4	0517	3.1	1113	4.8	1919	.4
11	0253	3.6	0641	3.2	1206	4.3	2007	.7
12	0338	3.8	0836	3.1	1318	3.7	2053	1.0
13	0410	4.1	1017	2.6	1454	3.3	2134	1.3
14	0439	4.5	1125	2.0	1627	3.1	2216	1.6
15	0503	4.9	1211	1.3	1745	3.2	2259	1.8
16	0535	5.3	1250	.5	1849	3.3	2338	2.0
17	0603	5.8	1331	-.2	1942	3.4	----	---
18	0019	2.1	0639	6.2	1411	-.8	2032	3.6
19	0101	2.2	0718	6.6	1453	-1.2	2119	3.6
20	0147	2.3	0759	6.8	1535	-1.5	2206	3.7
21	0229	2.3	0843	6.9	1620	-1.6	2254	3.7
22	0319	2.4	0932	6.8	1709	-1.5	2344	3.8
23	0414	2.4	1021	6.4	1756	-1.2	----	---
24	0039	3.9	0518	2.5	1116	5.8	1845	-.7
25	0131	4.1	0637	2.5	1216	5.0	1936	-.1
26	0227	4.5	0814	2.3	1335	4.2	2027	.5
27	0319	4.8	0952	1.8	1507	3.5	2120	1.1
28	0408	5.2	1112	1.1	1652	3.2	2216	1.6
29	0456	5.5	1218	.4	1822	3.2	2306	2.0
30	0540	5.8	1310	-.2	1930	3.3	2356	2.3
31	0617	6.0	1355	-.6	2024	3.4	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 27

SAN NICOLAS ISLAND TIDES
DECEMBER 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0616	5.3	1322	.1	1914	3.5	----	---
2	0036	1.3	0649	5.5	1404	-.4	2009	3.4
3	0108	1.6	0721	5.7	1443	-.6	2059	3.3
4	0144	1.8	0753	5.7	1522	-.8	2143	3.3
5	0216	2.1	0823	5.6	1600	-.7	2227	3.2
6	0247	2.2	0855	5.5	1638	-.6	2314	3.1
7	0316	2.4	0927	5.3	1718	-.4	0003	3.1*
8	0351	2.6	1003	5.0	1800	-.2	----	---
9	0058	3.0	0430	2.6	1041	4.7	1842	.1
10	0201	3.1	0527	2.8	1120	4.3	1929	.4
11	0300	3.3	0651	2.9	1213	3.9	2017	.6
12	0345	3.4	0846	2.8	1325	3.3	2103	.9
13	0417	3.7	1027	2.4	1501	3.0	2144	1.1
14	0446	4.0	1135	1.8	1634	2.8	2226	1.4
15	0510	4.4	1221	1.1	1752	2.9	2309	1.6
16	0542	4.8	1300	.4	1856	3.0	2348	1.8
17	0610	5.2	1341	-.2	1949	3.1	----	---
18	0029	1.8	0646	5.5	1421	-.7	2039	3.3
19	0111	1.9	0725	5.9	1503	-1.1	2126	3.3
20	0157	2.0	0806	6.1	1545	-1.3	2213	3.3
21	0239	2.0	0850	6.2	1630	-1.4	2301	3.3
22	0329	2.1	0939	6.1	1719	-1.3	2351	3.4
23	0424	2.1	1028	5.7	1806	-1.1	----	---
24	0046	3.5	0528	2.2	1123	5.2	1855	-.6
25	0138	3.7	0647	2.2	1223	4.5	1946	-.1
26	0234	4.0	0824	2.0	1342	3.8	2037	.4
27	0326	4.3	1002	1.6	1514	3.2	2130	1.0
28	0415	4.7	1122	1.0	1659	2.9	2226	1.4
29	0503	4.9	1228	.4	1829	2.9	2316	1.8
30	0547	5.2	1320	-.2	1937	3.0	0006	2.0*
31	0624	5.4	1405	-.5	2031	3.1	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 28. Moonrise and Moonset, Barking Sands, Hawaii, 1987.
Hawaii-Aleutian Standard Time

Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	0910	2016	0947	2205	0815	2045	0834	2217	0843	2253	1009	2346	1040	2326	1203	2336	1402		1452	0046	1537	0255	1523	0341
2	0958	2123	1021	2300	0850	2141	0916	2314	0935	2343	1102		1130	2356	1300		1506	0046	1541	0154	1613	0353	1602	0439
3	1040	2225	1055	2355	0925	2237	1002		1028		1154	0021	1222		1402	0016	1606	0151	1624	0300	1648	0451	1644	0538
4	1117	2322	1130		1001	2334	1052	0009	1123	0030	1246	0054	1315	0028	1508	0103	1700	0300	1703	0404	1725	0550	1730	0637
5	1151		1206	0050	1041		1144	0102	1217	0111	1338	0126	1412	0102	1616	0157	1748	0409	1740	0506	1806	0649	1821	0736
6	1224	0017	1246	0145	1124	0030	1238	0151	1311	0149	1431	0157	1513	0139	1721	0300	1830	0517	1816	0606	1850	0750	1915	0832
7	1257	0111	1330	0240	1210	0126	1333	0235	1403	0223	1527	0230	1619	0223	1821	0410	1909	0621	1853	0705	1938	0849	2010	0923
8	1331	0204	1418	0334	1301	0219	1428	0315	1456	0256	1628	0307	1728	0315	1913	0522	1946	0723	1931	0805	2030	0947	2105	1009
9	1408	0257	1509	0427	1354	0310	1521	0352	1550	0328	1733	0348	1837	0415	1959	0632	2022	0823	2013	0905	2125	1041	2159	1050
10	1449	0352	1603	0516	1449	0357	1615	0426	1645	0401	1842	0437	1941	0524	2039	0739	2059	0923	2059	1005	2220	1131	2251	1126
11	1534	0446	1658	0602	1544	0440	1709	0459	1745	0436	1952	0533	2037	0636	2116	0842	2139	1022	2149	1104	2315	1214	2341	1159
12	1623	0540	1753	0643	1633	0519	1804	0531	1848	0515	2059	0638	2126	0747	2152	0942	2221	1121	2241	1200		1253		1230
13	1716	0632	1847	0721	1732	0555	1901	0605	1955	0600	2158	0748	2209	0855	2228	1040	2308	1219	2336	1251	0008	1328	0031	1300
14	1810	0726	1940	0755	1826	0628	2001	0642	2104	0652	2250	0859	2246	0958	2305	1138	2358	1316		1338	0059	1401	0121	1331
15	1905	0804	2033	0823	1920	0701	2105	0722	2212	0751	2334	1007	2321	1058	2344	1235		1409	0031	1419	0150	1432	0213	1403
16	1959	0844	2126	0900	2015	0733	2212	0809	2314	0857		1110	2355	1155		1332	0051	1458	0125	1457	0241	1502	0308	1439
17	2052	0920	2221	0932	2112	0807	2319	0903		1006	0012	1210		1251	0027	1429	0145	1543	0217	1531	0333	1534	0407	1520
18	2145	0954	2318	1007	2212	0844		1003	0008	1113	0047	1306	0030	1346	0114	1524	0240	1622	0309	1602	0427	1609	0510	1609
19	2237	1026		1044	2316	0926	0023	1108	0055	1217	0121	1401	0107	1443	0205	1615	0334	1658	0400	1633	0524	1647	0617	1706
20	2330	1058	0018	1127		1014	0121	1215	0135	1318	0155	1456	0147	1539	0258	1702	0426	1731	0452	1705	0626	1732	0725	1810
21		1130	0122	1217	0021	1108	0211	1321	0212	1415	0229	1551	0231	1635	0353	1745	0518	1803	0545	1738	0732	1824	0829	1920
22	0025	1206	0229	1315	0126	1210	0255	1423	0246	1510	0307	1647	0319	1728	0447	1823	0609	1834	0640	1814	0838	1924	0927	2030
23	0124	1246	0334	1419	0228	1316	0334	1523	0319	1605	0348	1744	0410	1818	0540	1858	0701	1905	0739	1854	0944	2029	1017	2138
24	0227	1332	0436	1528	0324	1423	0413	1620	0353	1700	0433	1839	0534	1904	0632	1930	0754	1938	0842	1941	1043	2137	1100	2242
25	0334	1426	0531	1637	0413	1528	0444	1716	0428	1756	0522	1932	0558	1945	0723	2001	0849	2015	0946	2034	1136	2244	1139	2342
26	0443	1529	0619	1743	0456	1631	0513	1811	0507	1853	0615	2021	0652	2022	0814	2032	0948	2057	1051	2134	1222	2348	1215	
27	0550	1638	0702	1847	0535	1731	0553	1908	0550	1950	0709	2105	0745	2056	0905	2103	1050	2144	1153	2239	1302		1249	0040
28	0651	1750	0740	1947	0611	1829	0633	2005	0637	2045	0803	2145	0836	2128	0958	2137	1154	2239	1249	2346	1338	0049	1324	0137
29	0744	1859			0645	1926	0710	2102	0727	2137	0857	2221	0926	2158	1054	2215	1258	2340	1338		1413	0147	1401	0234
30	0836	2005			0720	2023	0755	2159	0820	2225	0949	2254	1017	2229	1154	2258	1358		1422	0051	1448	0244	1442	0332
31	0916	2107			0756	2120			0915	2309			1109	2301	1257	2348			1501	0154			1526	0430

TABLE 29

PORT ALLEN TIDES
JANUARY 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0443	2.2	1228	0.0	1649	.5	2202	-.2
2	0525	2.1	1307	0.0	1747	.5	2255	0.0
3	0608	1.9	1347	0.0	1857	.6	----	---
4	2353	.3*	0647	1.7	1425	0.0	2013	.8
5	0059	.4	0726	1.4	1501	0.0	2135	.9
6	0237	.6	0806	1.1	1537	0.0	2249	1.2
7	0448	.7	0845	.9	1611	0.0	----	---
8	2348	1.4*	0705	.6	0945	.7	1651	0.0
9	0036	1.5	0827	.4	1100	.5	1730	0.0
10	0121	1.7	0919	.3	1209	.4	1808	-.1
11	0156	1.8	0951	.3	1309	.4	1850	-.1
12	0230	1.9	1023	.3	1357	.4	1932	-.1
13	0304	1.9	1052	.2	1438	.4	2008	-.1
14	0335	2.0	1119	.2	1517	.5	2043	-.1
15	0406	1.9	1145	.2	1553	.5	2118	-.1
16	0434	1.9	1211	.2	1631	.5	2150	0.0
17	0503	1.8	1234	.1	1715	.6	2232	.1
18	0531	1.7	1257	.1	1807	.7	2314	.3
19	0600	1.5	1323	.1	1907	.8	----	---
20	0014	.4	0632	1.3	1350	.1	2016	.9
21	0131	.6	0701	1.1	1424	0.0	2135	1.1
22	0337	.7	0742	.9	1503	0.0	2245	1.4
23	0615	.6	0841	.7	1553	-.1	----	---
24	2347	1.6*	0755	.4	1021	.5	1648	-.1
25	0041	1.8	0847	.3	1157	.4	1746	-.2
26	0132	2.0	0926	.1	1311	.4	1845	-.3
27	0219	2.1	1003	0.0	1410	.4	1937	-.3
28	0301	2.2	1036	0.0	1501	.5	2029	-.3
29	0343	2.1	1111	-.1	1549	.6	2118	-.2
30	0422	2.0	1143	-.1	1637	.7	2210	-.1
31	0457	1.9	1212	-.1	1730	.9	2259	.1

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 30

PORT ALLEN TIDES
FEBRUARY 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0531	1.6	1241	0.0	1822	.9	----	---
2	2353	.3*	0603	1.4	1311	0.0	1921	1.0
3	0102	.4	0635	1.1	1339	0.0	2033	1.1
4	0235	.6	0700	.9	1412	0.0	2146	1.3
5	0509	.6	0712	.7	1451	0.0	2300	1.4
6	1545	.1	----	---	----	---	----	---
7	0000	1.5	1644	.1	----	---	----	---
8	0050	1.6	0911	.3	1215	.4	1746	0.0
9	0132	1.7	0932	.3	1314	.4	1838	0.0
10	0208	1.8	0951	.2	1355	.5	1920	0.0
11	0241	1.8	1009	.2	1432	.6	2002	-.1
12	0309	1.8	1031	.1	1504	.6	2041	-.1
13	0338	1.8	1052	.1	1539	.7	2117	0.0
14	0403	1.7	1111	.1	1615	.8	2155	0.0
15	0430	1.6	1129	.1	1654	.9	2240	.2
16	0457	1.4	1151	0.0	1739	1.0	2326	.3
17	0521	1.3	1214	0.0	1832	1.1	----	---
18	0028	.4	0549	1.0	1240	0.0	1933	1.2
19	0153	.5	0618	.9	1315	0.0	2043	1.4
20	0414	.5	0646	.6	1358	0.0	2206	1.4
21	1501	0.0	2320	1.6	----	---	----	---
22	0759	.3	1039	.3	1618	0.0	----	---
23	0021	1.8	0831	.2	1218	.3	1738	-.1
24	0112	2.0	0900	.1	1323	.5	1844	-.1
25	0159	2.0	0929	0.0	1412	.6	1942	-.2
26	0241	2.0	0957	-.1	1454	.8	2034	-.2
27	0317	1.9	1023	-.1	1537	.9	2123	-.1
28	0355	1.7	1047	-.1	1619	1.0	2215	0.0

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 31

PORT ALLEN TIDES
MARCH 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0427	1.5	1113	-.1	1704	1.2	2304	.2
2	0456	1.3	1136	-.1	1749	1.3	----	---
3	0001	.3	0524	1.1	1159	0.0	1838	1.3
4	0105	.4	0549	.9	1223	0.0	1934	1.3
5	0241	.5	0608	.7	1254	.1	2043	1.4
6	1328	.1	2158	1.4	----	---	----	---
7	1435	.2	2311	1.4	----	---	----	---
8	0807	.3	1100	.3	1601	.2	----	---
9	0009	1.5	0822	.3	1218	.4	1722	.2
10	0054	1.6	0839	.2	1307	.5	1819	.1
11	0132	1.6	0855	.2	1342	.6	1908	.1
12	0204	1.6	0917	.1	1417	.8	1954	0.0
13	0233	1.6	0932	.1	1449	.9	2036	0.0
14	0301	1.5	0950	0.0	1521	1.0	2118	.1
15	0330	1.4	1008	0.0	1556	1.2	2203	.1
16	0355	1.3	1028	-.1	1635	1.3	2250	.2
17	0423	1.1	1050	-.1	1717	1.4	----	---
18	2347	.3*	0448	.9	1112	-.1	1803	1.4
19	0056	.3	0520	.8	1143	-.1	1902	1.5
20	0232	.4	0552	.6	1220	0.0	2011	1.5
21	0456	.3	0644	.4	1307	0.0	2130	1.6
22	0635	.3	0915	.3	1427	.1	2247	1.6
23	0714	.2	1124	.3	1609	.1	----	---
24	2351	1.7*	0746	.1	1233	.5	1736	.1
25	0045	1.8	0813	0.0	1322	.7	1845	.1
26	0130	1.7	0839	-.1	1406	.9	1945	0.0
27	0209	1.6	0905	-.1	1445	1.1	2039	0.0
28	0248	1.4	0928	-.1	1524	1.3	2132	.1
29	0320	1.3	0950	-.1	1603	1.4	2223	.2
30	0348	1.1	1009	-.1	1642	1.4	2315	.2
31	0417	.9	1031	-.1	1717	1.5	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 32

PORT ALLEN TIDES
APRIL 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0012	.3	0445	.8	1053	-.1	1759	1.5
2	0118	.3	0510	.6	1118	0.0	1848	1.5
3	0249	.4	0535	.5	1143	.1	1946	1.4
4	1222	.2	2055	1.4	----	---	----	---
5	0624	.3	0848	.3	1329	.3	2207	1.4
6	0650	.3	1107	.4	1512	.3	2309	1.4
7	0711	.2	1209	.5	1645	.3	----	---
8	2357	1.4*	0733	.1	1248	.7	1759	.3
9	0039	1.4	0753	.1	1320	.9	1856	.2
10	0115	1.4	0810	0.0	1354	1.0	1948	.2
11	0147	1.4	0829	0.0	1427	1.2	2038	.2
12	0219	1.2	0847	-.1	1502	1.4	2125	.2
13	0251	1.1	0908	-.1	1537	1.5	2217	.2
14	0322	.9	0930	-.2	1613	1.7	2311	.2
15	0354	.8	0955	-.2	1658	1.8	----	---
16	0014	.3	0430	.6	1026	-.2	1747	1.8
17	0128	.3	0509	.4	1059	-.1	1843	1.8
18	0301	.3	0607	.3	1143	0.0	1948	1.7
19	0437	.2	0752	.3	1238	.1	2100	1.7
20	0536	.1	1009	.3	1414	.2	2209	1.6
21	0618	0.0	1135	.5	1605	.3	2313	1.5
22	0650	0.0	1230	.8	1738	.3	----	---
23	0006	1.4	0717	-.1	1313	.9	1853	.3
24	0051	1.4	0743	-.1	1355	1.2	1959	.3
25	0131	1.2	0809	-.2	1430	1.4	2053	.2
26	0208	1.0	0830	-.2	1506	1.5	2149	.2
27	0242	.9	0852	-.2	1541	1.7	2241	.2
28	0314	.7	0914	-.2	1616	1.7	2333	.3
29	0345	.6	0936	-.1	1652	1.7	----	---
30	0029	.3	0416	.5	1000	-.1	1733	1.7

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 33

PORT ALLEN TIDES
MAY 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0128	.3	0451	.4	1028	0.0	1816	1.6
2	0244	.3	0533	.3	1102	.1	1905	1.5
3	0353	.3	0656	.3	1137	.2	1959	1.5
4	0453	.2	0855	.3	1236	.3	2058	1.4
5	0529	.2	1045	.4	1416	.3	2154	1.4
6	0555	.1	1137	.6	1600	.4	2248	1.3
7	0621	.1	1219	.9	1730	.4	----	---
8	2333	1.3*	0642	0.0	1254	1.0	1842	.3
9	0015	1.1	0701	-.1	1330	1.3	1946	.3
10	0057	1.0	0725	-.1	1405	1.5	2044	.3
11	0136	.9	0748	-.2	1440	1.7	2139	.2
12	0211	.8	0817	-.3	1519	1.9	2235	.2
13	0253	.6	0846	-.3	1601	2.0	2335	.1
14	0333	.5	0921	-.3	1646	2.0	----	---
15	0036	.1	0424	.4	0956	-.2	1735	2.0
16	0142	.1	0521	.3	1039	-.1	1829	2.0
17	0249	.1	0640	.3	1131	0.0	1925	1.8
18	0348	0.0	0825	.3	1236	.2	2026	1.7
19	0438	0.0	1007	.5	1409	.3	2125	1.5
20	0517	-.1	1123	.8	1602	.4	2221	1.4
21	0549	-.1	1215	1.0	1746	.5	2316	1.2
22	0621	-.2	1258	1.3	1907	.4	----	---
23	0003	1.0	0647	-.2	1339	1.4	2016	.3
24	0049	.9	0714	-.2	1414	1.6	2118	.3
25	0129	.7	0739	-.2	1449	1.8	2211	.3
26	0211	.6	0804	-.2	1525	1.9	2303	.3
27	0247	.5	0829	-.2	1600	1.9	----	---
28	2348	.2*	0322	.4	0857	-.1	1633	1.9
29	0033	.2	0401	.3	0929	-.1	1710	1.8
30	0123	.2	0446	.3	1001	0.0	1749	1.8
31	0208	.2	0539	.3	1036	.1	1827	1.7

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 34

PORT ALLEN TIDES
JUNE 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0253	.2	0650	.3	1110	.2	1912	1.6
2	0332	.2	0823	.4	1214	.3	1957	1.4
3	0406	.1	0948	.6	1333	.4	2039	1.4
4	0435	.1	1051	.8	1520	.6	2128	1.2
5	0501	0.0	1140	1.0	1709	.6	2221	1.0
6	0529	0.0	1220	1.3	1839	.5	2310	.9
7	0559	-.1	1301	1.5	1953	.4	----	---
8	0005	.8	0626	-.2	1343	1.7	2059	.3
9	0054	.6	0703	-.3	1424	2.0	2159	.2
10	0142	.5	0739	-.3	1507	2.1	2250	.1
11	0238	.4	0817	-.3	1549	2.2	----	---
12	2343	.1*	0330	.3	0902	-.3	1636	2.2
13	0032	0.0	0427	.3	0944	-.2	1722	2.1
14	0121	0.0	0530	.3	1037	-.1	1811	2.0
15	0210	0.0	0658	.4	1132	.1	1858	1.9
16	0255	0.0	0811	.6	1241	.3	1947	1.6
17	0334	0.0	0942	.8	1411	.5	2036	1.4
18	0412	-.1	1048	1.0	1602	.6	2122	1.1
19	0446	-.1	1146	1.3	1759	.6	2218	.9
20	0520	-.1	1238	1.4	1932	.5	2311	.8
21	0552	-.1	1321	1.6	2045	.4	----	---
22	0009	.6	0624	-.1	1400	1.8	2144	.3
23	0057	.5	0656	-.1	1435	1.9	2229	.3
24	0150	.4	0730	-.1	1510	2.0	2308	.3
25	0232	.4	0805	-.1	1545	2.0	----	---
26	2340	.2*	0314	.4	0839	-.1	1617	2.0
27	0014	.2	0353	.4	0914	0.0	1649	1.9
28	0046	.2	0439	.4	0949	0.0	1721	1.9
29	0115	.2	0529	.4	1024	.1	1754	1.8
30	0147	.2	0624	.5	1108	.3	1826	1.6

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 35

PORT ALLEN TIDES
JULY 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0216	.2	0732	.6	1202	.4	1901	1.4
2	0243	.1	0842	.8	1315	.5	1936	1.3
3	0313	.1	0952	.9	1456	.7	2015	1.1
4	0345	0.0	1054	1.2	1701	.7	2104	.9
5	0421	0.0	1149	1.4	1853	.6	2206	.7
6	0459	-.1	1235	1.7	2016	.4	2322	.6
7	0542	-.2	1323	2.0	2115	.3	----	---
8	0033	.5	0631	-.2	1408	2.1	2200	.2
9	0137	.4	0719	-.3	1453	2.2	2242	.1
10	0233	.4	0808	-.3	1537	2.3	2321	.1
11	0329	.5	0857	-.3	1622	2.2	----	---
12	0003	0.0	0426	.5	0949	-.2	1705	2.1
13	0038	0.0	0522	.6	1039	0.0	1744	2.0
14	0117	0.0	0628	.8	1137	.2	1826	1.7
15	0152	0.0	0737	.9	1243	.4	1905	1.4
16	0227	0.0	0853	1.0	1409	.6	1941	1.2
17	0303	0.0	1008	1.3	1611	.7	2023	.9
18	0340	0.0	1111	1.4	1828	.7	2115	.8
19	0418	0.0	1209	1.6	2014	.5	2227	.6
20	0504	0.0	1257	1.8	2110	.4	----	---
21	2349	.5*	0549	0.0	1339	1.9	2144	.3
22	0055	.5	0634	0.0	1416	2.0	2213	.3
23	0147	.5	0716	0.0	1451	2.0	2239	.3
24	0228	.5	0755	0.0	1524	2.0	2303	.3
25	0307	.6	0833	0.0	1554	2.0	2329	.3
26	0343	.6	0909	.1	1621	1.9	----	---
27	2351	.3*	0424	.7	0947	.1	1650	1.8
28	0012	.2	0505	.8	1026	.3	1715	1.7
29	0038	.2	0551	.9	1108	.3	1743	1.5
30	0059	.2	0643	.9	1201	.5	1812	1.4
31	0125	.2	0746	1.1	1313	.7	1840	1.2

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 36

PORT ALLEN TIDES
AUGUST 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0154	.2	0856	1.2	1459	.8	1912	.9
2	0219	.1	1007	1.4	1731	.7	1954	.8
3	0315	.1	1114	1.6	1932	.5	2127	.6
4	0414	0.0	1213	1.9	2024	.4	2317	.5
5	0514	0.0	1304	2.0	2103	.3	----	---
6	0036	.5	0615	-.1	1351	2.1	2138	.2
7	0140	.6	0714	-.1	1436	2.2	2210	.2
8	0233	.7	0806	-.1	1519	2.2	2242	.1
9	0324	.8	0859	-.1	1558	2.1	2314	.1
10	0413	.9	0951	0.0	1637	2.0	----	---
11	2345	.1*	0503	1.0	1043	.2	1713	1.8
12	0014	.1	0559	1.1	1142	.3	1747	1.5
13	0043	.1	0657	1.3	1251	.5	1819	1.3
14	0113	.1	0802	1.4	1419	.7	1847	1.0
15	0144	.2	0912	1.4	1640	.7	1912	.8
16	0227	.2	1028	1.5	----	---	----	---
17	0317	.2	1136	1.7	2026	.4	2228	.5
18	0421	.3	1228	1.8	2044	.4	----	---
19	0004	.5	0526	.2	1313	1.9	2106	.3
20	0102	.6	0623	.2	1351	1.9	2128	.3
21	0143	.7	0708	.2	1424	2.0	2149	.3
22	0220	.8	0749	.2	1453	1.9	2210	.3
23	0254	.9	0831	.2	1521	1.9	2230	.3
24	0327	.9	0907	.2	1546	1.8	2247	.3
25	0401	1.0	0945	.3	1612	1.7	2306	.3
26	0437	1.1	1027	.3	1637	1.5	2324	.2
27	0519	1.2	1113	.4	1701	1.4	----	---
28	2347	.2*	0605	1.4	1212	.6	1729	1.2
29	0009	.2	0701	1.4	1330	.7	1755	1.0
30	0041	.2	0809	1.5	1533	.7	1826	.8
31	0123	.2	0926	1.6	----	---	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 37

PORT ALLEN TIDES
SEPTEMBER 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0223	.2	1041	1.8	1926	.4	2200	.5
2	0341	.2	1147	1.9	2001	.3	----	---
3	2348	.6*	0504	.2	1241	2.0	2027	.3
4	0054	.7	0613	.1	1329	2.1	2055	.2
5	0145	.9	0716	.1	1412	2.1	2124	.2
6	0231	1.0	0811	.1	1451	2.0	2152	.1
7	0313	1.2	0903	.1	1527	1.9	2217	.1
8	0355	1.3	0956	.2	1604	1.7	2242	.1
9	0441	1.4	1051	.3	1636	1.4	2308	.1
10	0528	1.5	1151	.4	1704	1.2	2335	.2
11	0615	1.6	1301	.6	1736	1.0	----	---
12	2359	.2*	0714	1.6	1437	.7	1758	.8
13	0030	.3	0820	1.6	----	---	----	---
14	0107	.3	0933	1.6	----	---	----	---
15	0212	.3	1047	1.7	1930	.4	2306	.6
16	0341	.4	1145	1.7	1952	.4	----	---
17	0012	.7	0507	.4	1231	1.8	2013	.3
18	0057	.8	0606	.3	1310	1.8	2035	.3
19	0129	.9	0659	.3	1344	1.8	2050	.3
20	0201	1.0	0745	.3	1413	1.7	2108	.3
21	0233	1.1	0826	.3	1441	1.6	2126	.3
22	0305	1.3	0908	.3	1506	1.5	2142	.2
23	0337	1.4	0950	.3	1535	1.4	2202	.2
24	0412	1.5	1039	.4	1600	1.3	2220	.2
25	0454	1.6	1132	.5	1625	1.1	2244	.2
26	0536	1.7	1233	.6	1654	.9	2310	.2
27	0632	1.7	1405	.6	1726	.8	----	---
28	2342	.2*	0734	1.8	1615	.5	1811	.6
29	0030	.3	0852	1.8	1802	.4	2035	.5
30	0143	.3	1008	1.8	1844	.3	2254	.6

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 38

PORT ALLEN TIDES
OCTOBER 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0326	.3	1114	1.9	1916	.3	----	---
2	0006	.7	0502	.3	1209	1.9	1941	.2
3	0055	.9	0618	.3	1257	1.9	2009	.1
4	0141	1.1	0720	.3	1339	1.8	2031	.1
5	0221	1.4	0820	.3	1418	1.6	2057	.1
6	0300	1.5	0915	.3	1456	1.4	2120	.1
7	0339	1.7	1009	.3	1528	1.3	2142	.1
8	0418	1.8	1105	.3	1600	1.0	2206	.1
9	0457	1.9	1208	.4	1629	.9	2228	.1
10	0543	1.9	1313	.5	1657	.7	2253	.2
11	0632	1.8	1446	.5	1729	.6	2319	.3
12	0727	1.7	----	---	----	---	----	---
13	2355	.3*	0833	1.7	1755	.4	2112	.5
14	0102	.4	0944	1.6	1824	.4	2311	.6
15	0252	.5	1045	1.6	1849	.3	----	---
16	0000	.8	0432	.5	1134	1.6	1908	.3
17	0042	.9	0544	.5	1217	1.6	1929	.3
18	0110	1.1	0647	.4	1255	1.5	1947	.2
19	0142	1.3	0737	.4	1327	1.4	2005	.2
20	0214	1.4	0825	.4	1359	1.4	2023	.1
21	0245	1.6	0915	.3	1427	1.2	2045	.1
22	0317	1.8	1004	.3	1459	1.0	2103	0.0
23	0356	1.9	1056	.4	1525	.9	2128	0.0
24	0435	2.0	1155	.4	1600	.8	2156	0.0
25	0521	2.0	1305	.4	1638	.6	2227	.1
26	0611	2.0	1431	.4	1731	.5	2306	.2
27	0712	2.0	1602	.3	1909	.4	----	---
28	0000	.3	0821	1.9	1702	.3	2129	.5
29	0124	.4	0929	1.8	1741	.2	2309	.7
30	0317	.5	1033	1.7	1820	.1	----	---
31	0004	.9	0504	.5	1132	1.6	1848	.1

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 39

PORT ALLEN TIDES
NOVEMBER 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0049	1.2	0626	.5	1218	1.5	1915	0.0
2	0131	1.4	0735	.4	1303	1.4	1938	0.0
3	0207	1.6	0837	.3	1342	1.2	2004	0.0
4	0246	1.8	0934	.3	1421	1.0	2028	-.1
5	0321	2.0	1028	.3	1456	.9	2050	0.0
6	0400	2.0	1123	.3	1528	.7	2115	0.0
7	0438	2.0	1219	.3	1603	.6	2140	0.0
8	0517	2.0	1321	.4	1638	.5	2209	.1
9	0559	1.9	1427	.3	1725	.4	2239	.2
10	0648	1.8	1547	.3	1842	.4	2314	.3
11	0741	1.7	1632	.3	2052	.5	----	---
12	0013	.4	0834	1.6	1711	.3	2242	.6
13	0149	.5	0932	1.5	1736	.3	----	---
14	2333	.8*	0516	.6	1021	1.4	1759	.2
15	0012	1.0	0520	.6	1110	1.4	1823	.1
16	0048	1.2	0635	.6	1152	1.2	1844	.1
17	0120	1.4	0736	.5	1234	1.1	1903	0.0
18	0151	1.6	0833	.4	1313	.9	1927	0.0
19	0224	1.8	0927	.3	1349	.9	1953	-.1
20	0302	2.0	1023	.3	1430	.7	2021	-.1
21	0341	2.1	1115	.3	1509	.6	2054	-.2
22	0423	2.1	1214	.3	1554	.5	2132	-.1
23	0510	2.1	1313	.3	1647	.4	2208	-.1
24	0558	2.0	1415	.2	1759	.4	2257	.1
25	0651	2.0	1511	.2	1933	.4	----	---
26	2356	.3*	0749	1.9	1600	.1	2124	.6
27	0122	.4	0845	1.7	1643	.1	2247	.9
28	0319	.6	0944	1.4	1717	0.0	----	---
29	2349	1.1*	0509	.6	1036	1.3	1749	0.0
30	0038	1.4	0644	.6	1135	1.1	1821	-.1

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 40

PORT ALLEN TIDES
DECEMBER 1987
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0118	1.6	0800	.5	1225	.9	1850	-.1
2	0155	1.8	0905	.4	1309	.8	1917	-.1
3	0234	2.0	1001	.3	1355	.6	1944	-.1
4	0311	2.0	1050	.3	1431	.5	2012	-.1
5	0345	2.0	1135	.3	1512	.5	2044	-.1
6	0420	2.0	1220	.3	1551	.4	2116	0.0
7	0457	2.0	1305	.3	1636	.4	2149	0.0
8	0534	1.9	1345	.3	1725	.4	2223	.1
9	0611	1.8	1427	.3	1829	.4	2303	.3
10	0650	1.7	1505	.3	1953	.5	----	---
11	2351	.4*	0728	1.5	1541	.2	2125	.6
12	0107	.5	0814	1.4	1612	.2	2238	.9
13	0253	.7	0858	1.3	1641	.1	----	---
14	2330	1.0*	0453	.7	0951	1.1	1709	.1
15	0012	1.3	0631	.6	1046	.9	1738	0.0
16	0051	1.5	0751	.5	1139	.8	1807	-.1
17	0130	1.8	0850	.4	1230	.6	1843	-.2
18	0208	2.0	0944	.3	1326	.5	1918	-.2
19	0247	2.1	1031	.2	1415	.5	1957	-.3
20	0329	2.2	1119	.2	1505	.4	2040	-.3
21	0412	2.2	1204	.1	1556	.4	2125	-.2
22	0457	2.2	1247	.1	1656	.4	2213	-.1
23	0541	2.1	1333	.1	1806	.5	2303	.1
24	0626	2.0	1415	0.0	1922	.6	----	---
25	0006	.3	0710	1.7	1456	0.0	2051	.8
26	0127	.5	0756	1.4	1535	0.0	2211	1.0
27	0317	.7	0848	1.2	1614	-.1	2320	1.3
28	0529	.7	0941	.9	1650	-.1	----	---
29	0015	1.4	0719	.6	1046	.7	1729	-.1
30	0101	1.7	0838	.4	1148	.6	1805	-.1
31	0143	1.9	0931	.3	1254	.5	1843	-.1

* -- TIDE OCCURS ON PREVIOUS DATE.

APPENDIX A

HEIGHT OF THE TIDE AT ANY TIME*

The height of the tide at times intermediate to the times of high and low water is needed on occasion, and may be computed by either numerical or graphical methods. One example of each method is presented here, using the predicted tides for a day at Point Mugu.

Problem: Given that the predicted times and heights of the tides are:

Time	Height	Time	Height	Time	Height	Time	Height
0039	4.9	0814	0.2	1510	3.1	1933	2.4

Find the height of the tide at 0300.

Numerical Method

The duration of fall is $08^h\ 14^m - 00^h\ 39^m = 7^h\ 35^m$.

The time after high water for which the height is required is $03^h\ 00^m - 00^h\ 39^m = 02^h\ 21^m$.

The range of tide is 4.9 – 0.2 = 4.7 feet.

Entering table A-1 at the duration of fall of $7^h\ 40^m$, which is the nearest value to $7^h\ 35^m$, the nearest value on the horizontal line to $2^h\ 21^m$ is $2^h\ 18^m$ after high water. Following down this column to its intersection with a range of 4.5 feet which is the nearest tabular value to 4.7 feet, one obtains 0.9 which, being calculated from high water, must be subtracted from it. The approximate height at $03^h\ 00^m$ is, therefore, 4.9 – 0.9 = 4.0 feet.

When the duration of rise or fall is greater than $10^h\ 40^m$, enter the table with one-half the given duration and with one-half the time from the nearest high or low water; but if the duration of rise or fall is less than 4 hours, enter the table with double the given duration and with double the time from the nearest high or low water.

*This information is adapted from table 3 of the data source for this publication (see page 1).

Table A-1. Height of the Tide at Any Time

Duration of rise or fall, see footnote.	Time from the nearest high water or low water																	
h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m	h. m
4 00	0 08	0 16	0 24	0 32	0 40	0 48	0 56	1 04	1 12	1 20	1 28	1 36	1 44	1 52	2 00			
4 20	0 09	0 17	0 26	0 35	0 43	0 52	1 01	1 09	1 18	1 27	1 35	1 44	1 53	2 01	2 10			
4 40	0 09	0 19	0 28	0 37	0 47	0 56	1 05	1 15	1 24	1 33	1 43	1 52	2 01	2 11	2 20			
5 00	0 10	0 20	0 30	0 40	0 50	1 00	1 10	1 20	1 30	1 40	1 50	2 00	2 10	2 20	2 30			
5 20	0 11	0 21	0 32	0 43	0 53	1 04	1 15	1 25	1 36	1 47	1 57	2 08	2 19	2 29	2 40			
5 40	0 11	0 23	0 34	0 45	0 57	1 08	1 19	1 31	1 42	1 53	2 05	2 16	2 27	2 39	2 50			
6 00	0 12	0 24	0 36	0 48	1 00	1 12	1 24	1 36	1 48	2 00	2 12	2 24	2 36	2 48	3 00			
6 20	0 13	0 25	0 38	0 51	1 03	1 16	1 29	1 41	1 54	2 07	2 19	2 32	2 45	2 57	3 10			
6 40	0 13	0 27	0 40	0 53	1 07	1 20	1 33	1 47	2 00	2 13	2 27	2 40	2 53	3 07	3 20			
7 00	0 14	0 28	0 42	0 56	1 10	1 24	1 38	1 52	2 06	2 20	2 34	2 48	3 02	3 16	3 30			
7 20	0 15	0 29	0 44	0 59	1 13	1 28	1 43	1 57	2 12	2 27	2 41	2 56	3 11	3 25	3 40			
7 40	0 15	0 31	0 46	1 01	1 17	1 32	1 47	2 03	2 18	2 33	2 49	3 04	3 19	3 35	3 50			
8 00	0 16	0 32	0 48	1 04	1 20	1 36	1 52	2 08	2 24	2 40	2 56	3 12	3 28	3 44	4 00			
8 20	0 17	0 33	0 50	1 07	1 23	1 40	1 57	2 13	2 30	2 47	3 03	3 20	3 37	3 53	4 10			
8 40	0 17	0 35	0 52	1 09	1 27	1 44	2 01	2 19	2 36	2 53	3 11	3 28	3 45	4 03	4 20			
9 00	0 18	0 36	0 54	1 12	1 30	1 48	2 06	2 24	2 42	3 00	3 18	3 36	3 54	4 12	4 30			
9 20	0 19	0 37	0 56	1 15	1 33	1 52	2 11	2 29	2 48	3 07	3 25	3 44	4 03	4 21	4 40			
9 40	0 19	0 39	0 58	1 17	1 37	1 56	2 15	2 35	2 54	3 13	3 33	3 52	4 11	4 31	4 50			
10 00	0 20	0 40	1 00	1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00	4 20	4 40	5 00			
10 20	0 21	0 41	1 02	1 23	1 43	2 04	2 25	2 45	3 06	3 27	3 47	4 08	4 29	4 49	5 10			
10 40	0 21	0 43	1 04	1 25	1 47	2 08	2 29	2 51	3 12	3 33	3 55	4 16	4 37	4 59	5 20			

Range of tide, see footnote.	Correction to height																	
Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
0.5	0 0	0 0	0 0	0 0	0 0	0 0	0.1	0.1	0 1	0 1	0 1	0 2	0 2	0 2	0 2			
1.0	0 0	0.0	0 0	0 0	0 1	0.1	0.1	0.2	0.2	0.2	0 3	0 3	0 4	0.4	0 5			
1.5	0 0	0 0	0 0	0 1	0 1	0.1	0.2	0.2	0 3	0.4	0.4	0.5	0 6	0 7	0 8			
2.0	0 0	0 0	0 0	0 1	0 1	0.2	0.3	0.3	0.4	0 5	0.6	0 7	0 8	0.9	1 0			
2.5	0 0	0 0	0 1	0 1	0 2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1 0	1.1	1 2			
3.0	0 0	0 0	0 1	0 1	0 2	0.3	0.4	0.5	0 6	0 8	0.9	1 0	1 2	1.3	1.5			
3.5	0 0	0 0	0 1	0 2	0 2	0.3	0 4	0.6	0 7	0 9	1 0	1 2	1 4	1.6	1 8			
4.0	0 0	0 0	0 1	0 2	0 3	0.4	0.5	0.7	0 8	1 0	1 2	1 4	1 6	1 8	2 0			
4.5	0 0	0 0	0 1	0 2	0 3	0.4	0.6	0.7	0.9	1.1	1.3	1 6	1.8	2 0	2.2			
5.0	0 0	0 1	0 1	0 2	0 3	0.5	0.6	0.8	1.0	1.2	1.5	1.7	2 0	2.2	2.5			
5.5	0 0	0 1	0 1	0 2	0 4	0.5	0.7	0.9	1.1	1.4	1 6	1 9	2 2	2 5	2 8			
6.0	0 0	0 1	0 1	0 3	0 4	0.6	0.8	1.0	1.2	1.5	1.8	2 1	2 4	2 7	3 0			
6.5	0 0	0 1	0 2	0 3	0 4	0.6	0.8	1.1	1.3	1.6	1.9	2 2	2 6	2 9	3.2			
7.0	0 0	0 1	0 2	0 3	0 5	0.7	0.9	1.2	1.4	1.8	2.1	2 4	2 8	3.1	3.5			
7.5	0 0	0 1	0 2	0 3	0 5	0.7	1.0	1.2	1.5	1 9	2.2	2.6	3.0	3.4	3 8			
8.0	0 0	0 1	0 2	0 3	0 5	0.8	1.0	1.3	1.6	2 0	2 4	2 8	3.2	3 6	4 0			
8.5	0 0	0 1	0 2	0 4	0 6	0.8	1.1	1.4	1.8	2.1	2.5	2 9	3 4	3.8	4.2			
9.0	0 0	0 1	0 2	0 4	0 6	0.9	1.2	1.5	1 9	2 2	2 7	3 1	3 6	4 0	4.5			
9.5	0 0	0 1	0 2	0.4	0 6	0.9	1.2	1.6	2.0	2.4	2 8	3 3	3 8	4.3	4.8			
10.0	0 0	0 1	0 2	0 4	0.7	1.0	1.3	1.7	2.1	2 5	3 0	3 5	4 0	4.5	5.0			
10.5	0 0	0 1	0 3	0 5	0.7	1.0	1.3	1.7	2 2	2 6	3.1	3.6	4 2	4 7	5.2			
11.0	0 0	0 1	0 3	0 5	0 7	1 1	1.4	1.8	2 3	2 8	3.3	3 8	4 4	4 9	5.5			
11.5	0 0	0 1	0 3	0 5	0 8	1.1	1.5	1.9	2.4	2 9	3.4	4 0	4.6	5 1	5.8			
12.0	0 0	0 1	0 3	0 5	0 8	1 1	1.5	2 0	2.5	3 0	3.6	4 1	4 8	5.4	6 0			
12.5	0 0	0 1	0 3	0 5	0 8	1.2	1.6	2.1	2.6	3.1	3.7	4.3	5 0	5 6	6.2			
13.0	0 0	0 1	0 3	0 6	0 9	1.2	1.7	2.2	2 7	3.2	3.9	4 5	5 1	5 8	6.5			
13.5	0 0	0 1	0 3	0 6	0 9	1 3	1.7	2.2	2.8	3.4	4 0	4 7	5.3	6 0	6.8			
14.0	0 0	0 2	0 3	0 6	0.9	1.3	1.8	2.3	2.9	3.5	4.2	4 8	5.5	6 3	7.0			
14.5	0 0	0 2	0 4	0 6	1 0	1.4	1.9	2.4	3.0	3.6	4.3	5 0	5.7	6.5	7.2			
15.0	0 0	0 2	0 4	0 6	1 0	1.4	1.9	2.5	3.1	3.8	4.4	5 2	5.9	6.7	7.5			
15.5	0 0	0 2	0 4	0 7	1.0	1.5	2.0	2.6	3.2	3.9	4.6	5 4	6 1	6.9	7 8			
16.0	0 0	0 2	0 4	0 7	1 1	1.5	2.1	2.6	3.3	4.0	4.7	5.5	6.3	7.2	8.0			
16.5	0 0	0 2	0 4	0 7	1.1	1 6	2.1	2.7	3 4	4.1	4.9	5.7	6 5	7.4	8.2			
17.0	0 0	0 2	0 4	0 7	1 1	1.6	2.2	2.8	3.5	4.2	5.0	5.9	6.7	7.6	8.5			
17.5	0 0	0 2	0 4	0 8	1 2	1.7	2.2	2.9	3.6	4.4	5.2	6.0	6.9	7.8	8.8			
18.0	0 0	0 2	0 4	0 8	1.2	1.7	2.3	3.0	3.7	4.5	5.3	6.2	7.1	8.1	9.0			
18.5	0 1	0 2	0 5	0 8	1 2	1.8	2.4	3.1	3.8	4.6	5.5	6.4	7.3	8.3	9 2			
19.0	0 1	0 2	0 5	0 8	1.3	1.8	2.4	3.1	3.9	4.8	5.6	6.6	7.5	8.5	9 5			
19.5	0 1	0 2	0 5	0 8	1 3	1 9	2.5	3 2	4 0	4 9	5 8	6.7	7.7	8.7	9 8			
20.0	0 1	0 2	0 5	0 9	1 3	1 9	2 6	3 3	1 1	5 0	5 9	6 9	7 9	9 0	10 0			

Obtain from the predictions the high water and low water, one of which is before and the other after the time for which the height is required. The difference between the times of occurrence of these tides is the duration of rise or fall, and the difference between their heights is the range of tide for the above table. Find the difference between the nearest high or low water and the time for which the height is required.

Enter the table with the duration of rise or fall, printed in heavy-faced type, which most nearly agrees with the actual value, and on that horizontal line find the time from the nearest high or low water which agrees most nearly with the corresponding actual difference. The correction sought is in the column directly below, on the line with the range of tide.

When the nearest tide is high water, subtract the correction.

When the nearest tide is low water, add the correction.

Graphical Method

If the height of the tide is required for a number of times on a certain day the full tide curve for the day may be obtained by the *one-quarter, one-tenth rule*. The procedure is as follows:

1. On cross-section paper plot the high and low water points in the order of their occurrence for the day, measuring time horizontally and height vertically. These are the basic points for the curve.

2. Draw light straight lines connecting the points representing successive high and low waters.

3. Divide each of these straight lines into four equal parts. The halfway point of each line gives another point for the curve.

4. At the quarter point adjacent to high water, draw a vertical line above the point, and at the quarter point adjacent to low water, draw a vertical line below the point, making the length of these lines equal to one-tenth of the range between the high and low waters used. The points marking the ends of these vertical lines give two additional intermediate points for the curve.

5. Draw a smooth curve through the points of high and low waters and the intermediate points, making the curve well rounded near high and low waters. This curve will approximate the actual tide curve and heights for any time of the day may be readily scaled from it. The resulting graph is shown in figure A-1.

CAUTION

Both methods presented are based on the assumption that the rise and fall conform to simple cosine curves. Therefore the heights obtained will be approximate. The roughness of approximation will vary as the tide curve differs from a cosine curve.

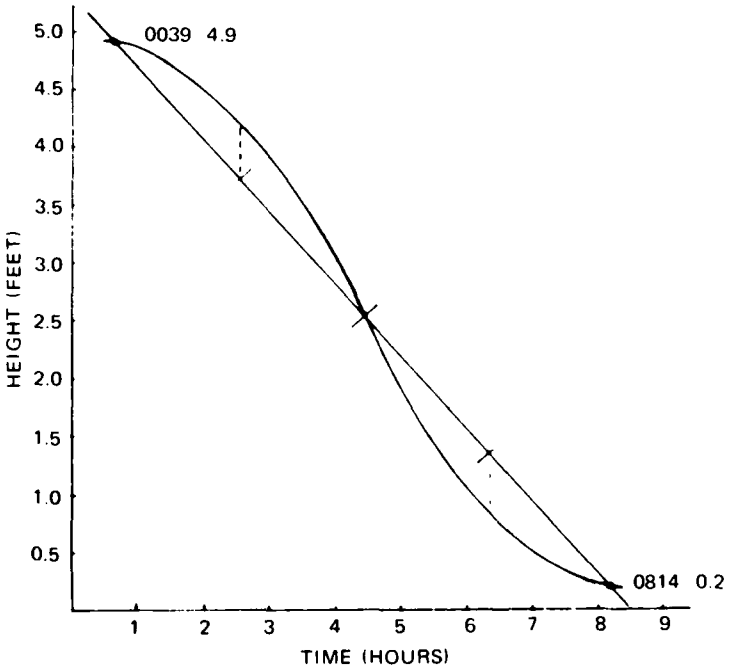

Figure A-1. Tidal Curve for Solution of the Problem.

APPENDIX B

EQUINOXES, SOLSTICES, AND LUNAR PHASES DURING 1987

The dates and times for Vernal and Autumnal Equinoxes and Summer and Winter Solstices during 1987 are listed in the table B-1. The 1987 dates and times for phases of the moon are given in table B-2. Both tables have been calculated for Point Mugu and San Nicolas Island. Two hours must be subtracted for times in the Barking Sands area.

Table B-1. Equinoxes and Solstices, 1987, Point Mugu and San Nicolas Island.

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for times in the Barking Sands area.

Vernal Equinox	20 March, 1952 PST	Beginning of Spring; day and night of equal length.
Summer Solstice	21 June, 1411 PST	Beginning of Summer; greatest duration of daylight.
Autumnal Equinox	23 September, 0545 PST	Beginning of Autumn; day and night of equal length.
Winter Solstice	22 December, 0146 PST	Beginning of Winter; greatest duration of darkness.

Table B-2. Lunar Phases, 1987, Point Mugu and San Nicolas Island.

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for times in the Barking Sands area.

Phase	January		February		March		April	
	Date	Time	Date	Time	Date	Time	Date	Time
First Quarter	06	1434	05	0821	07	0358	05	2348
Full Moon	14	1830	13	1258	15	0513	13	1831
Last Quarter	22	1445	21	0056	22	0822	20	1415
New Moon	29	0544	27	1651	29	0446	27	1734
Phase	**May**		**June**		**July**		**August**	
	Date	Time	Date	Time	Date	Time	Date	Time
First Quarter	05	1826	04	1053	04	0034	02	1124
Full Moon	13	0450	11	1249	10	1933	09	0217
Last Quarter	19	2002	18	0302	17	1217	16	0025
New Moon	27	0713	25	1237	25	1237	24	0359
First Moon	--	----	--	----	--	----	31	1948
Phase	**September**		**October**		**November**		**December**	
	Date	Time	Date	Time	Date	Time	Date	Time
Full Moon	07	1013	06	2012	05	0846	05	0001
First Quarter	14	1544	14	1006	13	0634	13	0341
New Moon	22	1908	22	0928	20	2233	20	1025
First Quarter	30	0239	29	0910	27	1637	27	0201

Because the earth's period of revolution about the sun (365.24 + days) is not evenly divisible by the moon's period of revolution about the earth (27.32 + days), the dates and times of lunar phases, moonrise and moonset, and tidal data must be recomputed for each year. The following information, however, is based on geometrical relationships and holds true for all times:

1. The New Moon rises at sunrise, crosses the meridian at noon, and sets at sunset.
2. The First Quarter Moon rises at noon, crosses the meridian at sunset, and sets at midnight.
3. The Full Moon rises at sunset, crosses the meridian at midnight, and sets at sunrise.
4. The Last Quarter Moon rises at midnight, crosses the meridian at sunrise, and sets at noon.

APPENDIX C

SUNRISE AND SUNSET TABLES

Sunrise, Sunset, and Duration of Twilight for Point Mugu, CA
34°07' N, 119°07' W

Note: All times are Pacific Standard Time (120th meridian); add 1 hour when Daylight Savings Time is in effect.

Date	January		February		March		April		May		June		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0702	1658	0654	1727	0626	1753	0544	1817	0507	1840	0446	1903	1
2	0703	1659	0653	1728	0624	1753	0543	1818	0506	1841	0446	1903	2
3	0703	1700	0652	1729	0623	1754	0541	1819	0505	1842	0445	1904	3
4	0703	1700	0652	1730	0622	1755	0540	1819	0504	1843	0445	1904	4
5	0703	1701	0651	1731	0621	1756	0539	1820	0503	1843	0445	1905	5
6	0703	1702	0650	1732	0619	1757	0537	1821	0502	1844	0445	1905	6
7	0703	1703	0649	1733	0618	1758	0536	1822	0502	1845	0445	1906	7
8	0703	1704	0648	1734	0617	1758	0535	1822	0501	1846	0444	1906	8
9	0703	1705	0647	1734	0615	1759	0533	1823	0500	1846	0444	1907	9
10	0703	1705	0647	1735	0614	1800	0532	1824	0459	1847	0444	1907	10
11	0703	1706	0646	1736	0613	1801	0531	1825	0458	1848	0444	1908	11
12	0703	1707	0645	1737	0611	1802	0530	1825	0457	1849	0444	1908	12
13	0703	1708	0644	1738	0610	1802	0528	1826	0456	1849	0444	1909	13
14	0702	1709	0643	1739	0609	1803	0527	1827	0456	1850	0444	1909	14
15	0702	1710	0642	1740	0607	1804	0526	1828	0455	1851	0444	1909	15
16	0702	1711	0641	1741	0606	1805	0525	1829	0454	1852	0444	1910	16
17	0702	1712	0640	1742	0605	1806	0523	1829	0453	1852	0444	1910	17
18	0701	1713	0638	1743	0603	1806	0522	1830	0453	1853	0445	1910	18
19	0701	1714	0637	1744	0602	1807	0521	1831	0452	1854	0445	1911	19
20	0701	1715	0636	1745	0601	1808	0520	1832	0451	1855	0445	1911	20
21	0700	1716	0635	1746	0559	1809	0518	1832	0451	1855	0445	1911	21
22	0700	1717	0634	1747	0558	1809	0517	1833	0450	1856	0445	1911	22
23	0659	1718	0633	1747	0556	1810	0516	1834	0450	1857	0446	1911	23
24	0659	1719	0632	1748	0555	1811	0515	1835	0449	1857	0446	1912	24
25	0658	1720	0630	1749	0554	1812	0514	1835	0449	1858	0446	1912	25
26	0658	1721	0629	1750	0552	1813	0513	1836	0448	1859	0446	1912	26
27	0657	1722	0628	1751	0551	1813	0512	1837	0448	1900	0447	1912	27
28	0657	1723	0627	1752	0550	1814	0511	1838	0447	1900	0447	1912	28
29	0656	1724	0626	1752	0548	1815	0509	1839	0447	1901	0447	1912	29
30	0655	1725			0547	1816	0508	1839	0447	1901	0448	1912	30
31	0655	1726			0546	1816			0446	1902			31
	Average twilight Civil: 27 min. Nautical: 58 min.		Average twilight Civil: 26 min. Nautical: 55 min.		Average twilight Civil: 25 min. Nautical: 54 min.		Average twilight Civil: 26 min. Nautical: 57 min.		Average twilight Civil: 28 min. Nautical: 61 min.		Average twilight Civil: 29 min. Nautical: 65 min.		
Date	July		August		September		October		November		December		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0448	1912	0507	1858	0530	1823	0551	1741	0616	1704	0644	1647	1
2	0449	1912	0508	1857	0530	1821	0551	1740	0617	1703	0645	1647	2
3	0449	1912	0509	1856	0531	1820	0552	1738	0618	1702	0646	1647	3
4	0450	1912	0510	1855	0532	1819	0553	1737	0619	1701	0646	1647	4
5	0450	1912	0510	1854	0532	1817	0554	1736	0620	1700	0647	1647	5
6	0451	1911	0511	1853	0533	1816	0554	1734	0621	1659	0648	1647	6
7	0451	1911	0512	1852	0534	1815	0555	1733	0621	1658	0649	1647	7
8	0452	1911	0512	1851	0535	1813	0556	1732	0622	1658	0650	1647	8
9	0452	1911	0513	1850	0535	1812	0557	1730	0623	1657	0650	1647	9
10	0453	1910	0514	1849	0536	1810	0557	1729	0624	1656	0651	1647	10
11	0453	1910	0515	1848	0537	1809	0558	1728	0625	1655	0652	1647	11
12	0454	1910	0515	1847	0537	1808	0559	1726	0626	1655	0653	1648	12
13	0454	1909	0516	1846	0538	1806	0600	1725	0627	1654	0653	1648	13
14	0455	1909	0517	1845	0539	1805	0601	1724	0628	1653	0654	1648	14
15	0456	1909	0518	1844	0539	1803	0601	1723	0629	1653	0655	1648	15
16	0456	1908	0518	1843	0540	1802	0602	1721	0630	1652	0655	1649	16
17	0457	1908	0519	1841	0541	1801	0603	1720	0631	1652	0656	1649	17
18	0458	1907	0520	1840	0541	1759	0604	1719	0632	1651	0657	1650	18
19	0458	1907	0520	1839	0542	1758	0605	1718	0633	1651	0657	1650	19
20	0459	1906	0521	1838	0543	1756	0606	1717	0634	1650	0658	1650	20
21	0500	1906	0522	1837	0544	1755	0606	1715	0635	1650	0658	1651	21
22	0500	1905	0523	1835	0544	1754	0607	1714	0636	1649	0659	1651	22
23	0501	1904	0523	1834	0545	1752	0608	1713	0637	1649	0659	1652	23
24	0502	1904	0524	1833	0546	1751	0609	1712	0637	1649	0700	1653	24
25	0502	1903	0525	1832	0546	1749	0610	1711	0638	1648	0700	1653	24
26	0503	1902	0525	1830	0547	1748	0611	1710	0639	1648	0700	1654	26
27	0504	1902	0526	1829	0548	1747	0611	1709	0640	1648	0701	1654	27
28	0504	1901	0527	1828	0549	1745	0612	1708	0641	1647	0701	1655	28
29	0505	1900	0528	1827	0549	1744	0613	1707	0642	1647	0702	1656	29
30	0506	1859	0528	1825	0550	1742	0614	1706	0643	1647	0702	1656	30
31	0507	1858	0529	1824			0615	1705			0702	1657	31
	Average twilight Civil: 29 min. Nautical: 63 min.		Average twilight Civil: 26 min. Nautical: 58 min.		Average twilight Civil: 25 min. Nautical: 55 min.		Average twilight Civil: 25 min. Nautical: 54 min.		Average twilight Civil: 27 min. Nautical: 57 min.		Average twilight Civil: 28 min. Nautical: 59 min.		

Retain for use in future years. These data valid through 2020.

Sunrise, Sunset, and Duration of Twilight for Barking Sands, Kauai, HI
22°02' N, 159°47' W

Note: All times are Alaska-Hawaii Standard Time (150th Meridian).

Date	January		February		March		April		May		June		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0718	1807	0718	1828	0700	1843	0632	1854	0607	1905	0555	1919	1
2	0719	1808	0717	1829	0659	1843	0631	1855	0607	1906	0555	1919	2
3	0719	1809	0717	1830	0659	1844	0630	1855	0606	1906	0555	1920	3
4	0719	1809	0716	1830	0658	1844	0629	1855	0606	1906	0555	1920	4
5	0719	1810	0716	1831	0657	1845	0628	1856	0605	1907	0555	1920	5
6	0720	1811	0715	1831	0656	1845	0627	1856	0604	1907	0555	1921	6
7	0720	1811	0715	1832	0655	1846	0627	1856	0604	1908	0555	1921	7
8	0720	1812	0714	1833	0654	1846	0626	1857	0603	1908	0555	1921	8
9	0720	1813	0714	1833	0653	1846	0625	1857	0603	1909	0555	1922	9
10	0720	1813	0713	1834	0653	1847	0624	1857	0602	1909	0555	1922	10
11	0720	1814	0713	1834	0652	1847	0623	1858	0602	1909	0555	1922	11
12	0721	1815	0712	1835	0651	1847	0622	1858	0601	1910	0555	1923	12
13	0721	1815	0712	1835	0650	1848	0621	1858	0601	1910	0555	1923	13
14	0721	1816	0711	1836	0649	1848	0620	1859	0600	1911	0555	1923	14
15	0721	1817	0710	1836	0648	1848	0620	1859	0600	1911	0555	1924	15
16	0721	1818	0710	1837	0647	1849	0619	1859	0559	1912	0555	1924	16
17	0721	1818	0709	1837	0646	1849	0618	1900	0559	1912	0556	1924	17
18	0721	1819	0709	1838	0645	1850	0617	1900	0559	1913	0556	1925	18
19	0721	1820	0708	1838	0644	1850	0616	1900	0558	1913	0556	1925	19
20	0720	1820	0707	1839	0643	1850	0615	1901	0558	1914	0556	1925	20
21	0720	1821	0706	1839	0642	1851	0615	1901	0558	1914	0556	1925	21
22	0720	1822	0706	1840	0641	1851	0614	1902	0557	1914	0557	1925	22
23	0720	1822	0705	1840	0641	1851	0613	1902	0557	1915	0557	1926	23
24	0720	1823	0704	1841	0640	1852	0612	1902	0557	1915	0557	1926	24
25	0720	1824	0703	1841	0639	1852	0612	1903	0557	1916	0557	1926	25
26	0719	1824	0703	1842	0638	1852	0611	1903	0556	1916	0558	1926	26
27	0719	1825	0702	1842	0637	1853	0610	1904	0556	1917	0558	1926	27
28	0719	1826	0701	1843	0636	1853	0609	1904	0556	1917	0558	1926	28
29	0719	1826	0701	1843	0635	1853	0609	1904	0556	1917	0558	1926	29
30	0718	1827			0634	1854	0608	1905	0555	1918	0559	1927	30
31	0718	1828			0633	1854			0555	1918			31
	Average twilight Civil: 24 min. Nautical: 51 min.		**Average twilight Civil: 23 min. Nautical: 49 min.**		**Average twilight Civil: 22 min. Nautical: 48 min.**		**Average twilight Civil: 23 min. Nautical: 50 min.**		**Average twilight Civil: 24 min. Nautical: 53 min.**		**Average twilight Civil: 25 min. Nautical: 55 min.**		

Date	July		August		September		October		November		December		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0559	1927	0611	1919	0622	1856	0630	1827	0643	1802	0702	1755	1
2	0559	1927	0612	1919	0622	1855	0631	1826	0643	1802	0702	1755	2
3	0600	1927	0612	1918	0623	1854	0631	1825	0644	1801	0703	1755	3
4	0600	1927	0612	1918	0623	1853	0631	1824	0645	1801	0703	1755	4
5	0600	1927	0613	1917	0623	1852	0632	1823	0645	1800	0704	1755	5
6	0601	1927	0613	1916	0623	1851	0632	1822	0646	1800	0705	1756	6
7	0601	1927	0614	1916	0624	1850	0632	1821	0646	1759	0705	1756	7
8	0602	1927	0614	1915	0624	1849	0633	1820	0647	1759	0706	1756	8
9	0602	1926	0614	1914	0624	1848	0633	1819	0647	1758	0707	1756	9
10	0602	1926	0615	1914	0625	1847	0633	1819	0648	1758	0707	1757	10
11	0603	1926	0615	1913	0625	1846	0634	1818	0649	1758	0708	1757	11
12	0603	1926	0616	1912	0625	1845	0634	1817	0649	1757	0709	1757	12
13	0603	1926	0616	1912	0625	1844	0634	1816	0650	1757	0709	1758	13
14	0604	1926	0616	1911	0626	1843	0635	1815	0650	1757	0710	1758	14
15	0604	1926	0617	1910	0626	1842	0635	1814	0651	1756	0710	1758	15
16	0605	1925	0617	1909	0626	1841	0636	1813	0652	1756	0711	1759	16
17	0605	1925	0617	1909	0626	1840	0636	1813	0652	1756	0712	1759	17
18	0606	1925	0618	1908	0627	1839	0636	1812	0653	1756	0712	1800	18
19	0606	1925	0618	1907	0627	1838	0637	1811	0654	1755	0713	1800	19
20	0606	1924	0618	1906	0627	1837	0637	1810	0654	1755	0713	1800	20
21	0607	1924	0619	1905	0628	1836	0638	1810	0655	1755	0714	1801	21
22	0607	1924	0619	1905	0628	1836	0638	1809	0656	1755	0714	1801	22
23	0608	1923	0619	1904	0628	1835	0639	1808	0656	1755	0715	1802	23
24	0608	1923	0620	1903	0628	1834	0639	1807	0657	1755	0715	1803	24
25	0608	1922	0620	1902	0629	1833	0639	1807	0658	1755	0716	1803	25
26	0609	1922	0620	1901	0629	1832	0640	1806	0658	1755	0716	1804	26
27	0609	1922	0621	1900	0629	1831	0640	1805	0659	1755	0716	1804	27
28	0610	1921	0621	1859	0630	1830	0641	1805	0700	1755	0717	1805	28
29	0610	1921	0621	1859	0630	1829	0641	1804	0700	1755	0717	1805	29
30	0610	1920	0621	1858	0630	1828	0642	1803	0701	1755	0718	1806	30
31	0611	1920	0622	1857			0642	1803			0718	1807	31
	Average twilight Civil: 25 min. Nautical: 54 min.		**Average twilight Civil: 23 min. Nautical: 50 min.**		**Average twilight Civil: 22 min. Nautical: 48 min.**		**Average twilight Civil: 23 min. Nautical: 49 min.**		**Average twilight Civil: 24 min. Nautical: 51 min.**		**Average twilight Civil: 24 min. Nautical: 52 min.**		

Retain for use in future years. These data valid through 2020.

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